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VIEWS, NEWS AND INTERVIEWS.

Mr. F. H. Davidson, inspector of wires at Chelsea, Mass., was recently arrested, charged with causing the death, on May 14, of two men who were killed by coming in contact with a live wire. At the coroner's inquest it was charged that Mr. Davidson was guilty of gross negligence in allowing the wires to be placed as they were, and further guilty for permitting them to remain in an unlawful position in violation of the city ordinances. This, it is believed, is the first case in which criminal negligence has been charged against an inspector of wires.

The New Orleans & Carrollton Railroad Company has recently completed a number of car bodies at its own shop in New Orleans. All the parts of the cars are southern products except the trucks. The new cars are to be equipped with double motors.

They have a law in Massachusetts which requires reports to be made of the fees paid for lobbying at the State House. The reports for this year were made on July 12, and were the largest in amount ever filed. The West End Street Railway Company paid to E. W. Burdett, for himself as general legislative counsel, and S. J. Elder, as special legislative counsel, $12,000. The Massachusetts Electric Lighting Association paid to E. W. Burdett $2,500 as general counsel, and to J. O. Wardwell $1,250 as special counsel on matters affecting its interests.

In Brooklyn, N. Y., last week, the Appellate Division of the Supreme Court handed down a decision in which the validity of the trolley car speed ordinance adopted by the Board of Aldermen is upheld. The rate of speed is fixed at eight miles an hour as the limit. Over 100 cases of speed violations are affected by the decision.

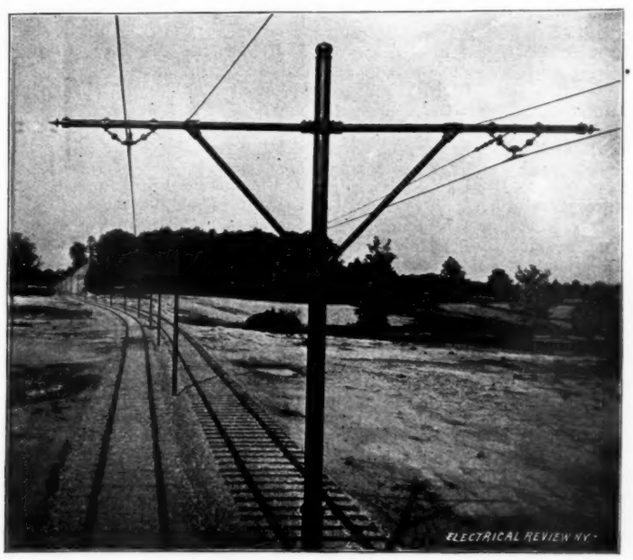
The most extensive street-car line in the United States now using horses for motive power is located in New York city. It is reported that this line has great difficulty in securing car horses, owing to the fact that they have been so generally replaced by electric and cable power. A recent order for horses resulted in the discovery that there were almost no street-car horses of any kind to be bought. Formerly it was the custom to send out an order for 100 or 500 horses and have the order promptly filled. Now it is necessary for the street-car company to go from stable to stable and buy them one at a time.

A five-mile canal at Oklahoma City, which carried water for power purposes, has been destroyed by gophers.

Mr. A. C. Greenberg, president of the Atlantic Highlands, Red Bank & Long Branch Electric Railroad Company, was arrested at Long Branch, N. J., on July 11, on a charge of trespassing and violating the Sabbath. Mrs. Enoch Lippincott, who owns property upon which the trolley company had laid tracks without her consent, caused the president's arrest. A gang of men were at work tearing up the tracks when the constable took Mr. Greenberg into custody.

A dispatch from Oaxaca, Mexico, dated July 11, states that the India Rubber Company, of Mexico, an English corporation, with a paid-up capital of $2,000,000, is going into the rubber industry in Mexico on an extensive scale. This company is now planting 5,000,000 rubber trees on their lands in the district of Pochutla. They have 400 men at work on the land now.

A Lewiston, Me., lady recently conceived the idea that she had swallowed something hard and that it had lodged in her stomach, and she insisted on having an X-ray picture taken, in order that the foreign substance might be located. When the plate was developed, to her horror a large shawl pin was discovered, apparently lodged in the bowels. After a great deal of worry on her part, it was discovered that the pin was not in her body, but had been used to pin a sheet about her before the picture was taken.



Rapid Electric Railway Construction.—A Section of the Washington & Maryland Electric Railway Company's Road.

Rapid Electric Railway Construction.

In the accompanying illustration is shown a section of the Washington & Maryland Electric Railway Company's track, popularly known as the Boulevard Line. The overhead work on this section of the line is probably the heaviest known and was undoubtedly installed in record time. The road when completed is to connect Washington, D. C., and Baltimore. Outside of the city of Washington and within the District of Columbia the company had a franchise which was about to lapse unless the overhead work was finished at a certain date. This section of the road was two and three quarter miles long and there remained but 13 days in which to put up the overhead work and save the franchise.

This seemingly impossible task was successfully performed in exactly 12 days by the well known firm of engineers and contractors, J. G. White & Company, of New York. The trolley wire used is 0000, specially drawn for the purpose by the American Electrical Works of Providence, R. I. The poles are of special construction, weighing 1,000 pounds each, and were made to order by Morris, Tasker & Company, of Philadelphia. All of the overhead fittings and fixtures were cast and made to order and it required the liveliest kind of supervision and rapid work to get everything done on time. That the work was finished within the limit of time set and in such a handsome manner, as shown by the illustration, speaks highly for every one concerned with the undertaking.

OBITUARY.

Dr. Alfred Marshall Mayer died on July 13 at his Summer residence, Maplewood, N. J., after a protracted illness, at the age of 61 years. Dr. Mayer was elected professor of physics at the Stevens Institute of Technology, Hoboken, N. J., in 1871, and had occupied this chair uninterruptedly for nearly 26 years. He had written many scientific papers of value, especially on acoustics.

THE APPLICATION OF ELECTRICITY TO STEAM RAILROADS.

READ BEFORE THE CONVENTION OF THE MASTER MECHANICS' ASSOCIATION, JUNE 15, 1897, BY PAUL H. BRANGS, E. E.

The recent developments in the application of electricity to the present existing steam railroads is a question that is of great interest to the practical railroad men of the present day. The many advantages to be gained by the partial substitution of electricity for steam, in conjunction with the steam locomotive, must be apparent to all wideawake railroad managers. The tremendous inroads that have been made in the receipts of local passenger traffic on the majority of steam railroads of to-day, by the electric trolley roads, makes it manifest that something must be done to check these inroads.

The demands of the traveling public, living in suburban towns, have become very fastidious of late, and justly so, from the adequate facilities afforded by the electric lines.

They have paralleled our railroads, in many cases to such an extent that it has put the railroad managers to severe perplexity as to the best method of meeting this great competitor. Many railroads running from large cities into the suburbs, who have large suburban traffic, are at a loss to know how they can accommodate the demands of the public for more frequent trains, without very materially increasing their operating expenses. This, of course, is a very grave matter, as short and frequent trains, with locomotive traction, are expensive, in view of the fact that each train must be fully equipped with locomotive engineer and fireman and a full crew, whether there be three cars or ten.

The running of short and frequent trains by locomotive traction would not be so extravagant if the motive-power department had at all times such sizes and weights of locomotives as were best suited for the purposes required. The tendency of late years has been towards heavier and more powerful locomotives, so that when called upon they can haul the heaviest and largest trains, but it is only during certain hours of the morning and evening, when traffic is heavy, that they are required to haul such heavy trains; consequently, at other hours, one can see these same powerful and heavy locomotives hauling trains of one-fourth or one-third their actual capacity.

A locomotive weighing, say, 50 tons, will have about 40 tons on the drivers, possibly more. The tender will weigh about 25 tons, and the coal and water 10 tons more. Therefore, out of 85 tons of engine, tender, coal and water, only about 40 tons rest on the drivers, or about 50 per cent. At slow speed, the capacity of the locomotive depends not on the amount of work the steam in the cylinders can do, but upon the adhesion of the wheels to the track, or, in other words, upon the weight of the drivers. Now, as only one-half the weight rests on the drivers, the other half is useless, and is just so much dead weight that has to be hauled over the road for nothing. It can thus be readily seen that an electric motor under average speed, with half the total weight of the steam locomotive, would do just as much useful work, with less wear and tear on the roadbed and track.

By the partial substitution of electrical traction for the exclusive locomotive traction, this could be vastly and economically improved. The heavy locomotives could be still used for drawing heavy through express and freight trains, while the short and local trains could be run by electricity.

Most of the railroads running into large cities which have a large commutation or suburban traffic, have four tracks running for some distance from such cities. In that event I would advocate equipping two tracks with electricity, and running two or three-car trains at short intervals, thereby making it a rapid transit system.

Almost every one of the trunk lines running into New York city have a more or less number of leased lines and branches, which are used as feeders for the trunk lines. These lines also are particularly favorable as regards grades and locations for the trolley lines, which are great competitors, in many cases paralleling them for many miles, and, unfortunately for the railroad companies, carrying passengers, in many cases for less than one-half the fares that were charged by the steam railroad companies. In one case particularly (Philadelphia, I believe), one of the large steam lines lost so much traffic that it has attempted to regain it by reducing prices and increasing the number of trains. In this it has partially succeeded, but at great expense and decreased receipts. There are certain kinds of local traffic which the steam railroads must, to a large extent, lose, and which, in the nature of things, they can not regain. In large cities having considerable suburban traffic, the trolley roads, forming, as they do, a net-work of lines in the city, and extending in every direction into the suburbs, offer advantages, with which the steam railroad can not compete. As far as those branch lines go, whether it would pay to partially or wholly substitute electricity for steam depends upon the local conditions prevailing.

I would advocate, as far as possible, the equipping of these small branches electrically, and as the gauge of roadbed and other things would be the same, this would greatly facilitate the matter while change of construction was going on. I fully believe that if many of the small branches of the various railroads centered around New York city were equipped electrically, so that short and frequent trains could be run at a profit, it would add very materially to the advantages of the trunk line.

Objection will be made that the trolley, or the third rail, as the case may be, would interfere with the operation of the railroad, but I see no reason why they could not be run jointly. During such hours of the day when the traffic might be light, freight might be drawn by electric motors to the various small towns along the line, which rarely have more than one or two cars. This in itself would be a very great saving, as now special freight trains have to be made up. The consumer is now often put to great inconvenience by only getting one freight train a day, whereas, by the partial substitution of electricity, these cars could be drawn by the same electric motors or motor cars used for the passenger traffic. Another important adjunct to this would be the quick delivery of express matter, which is, of course, a source of great revenue to the railroad companies.

As to the nature of the equipment that will be required, it would depend upon the work to be done and the branch to be equipped. In some cases it might be well to use single electric cars while in other cases two or three-car trains could be used.

In a very able article written some years ago by Mr. O. T. Crosby, on "The Limitations of Steam and Electricity in Transportation," he made very thorough researches into the subject of the costs of repairs to steam locomotives versus the electric motor, and from deductions arrived at he reasoned that the cost of repairs to motors would not be more than 30 per cent of the amount expended on steam locomotives. At the time this article was written, however, it is doubtful whether these claims could have been substantiated. It is a well known fact that the construction and efficiency of electric motors have been vastly improved, and I venture to say that if he was correct then in allowing that the cost of repairs would not be more than 30 per cent that of steam locomotives, it can reasonably be supposed to be very much less to-day.

It is conceded by all well informed engineers that the locomotive is an unbalanced machine, and can not be made otherwise. The moving parts of a steam engine can be balanced either in a vertical or a horizontal direction, but not in both. A locomotive can be balanced vertically by placing a counter-balance weight in the driving-wheel, opposite the crank, about equal to the crank-pin and half the connecting rod; to balance it horizontally it is necessary to make this weight equal all the moving parts; that is to say, the piston, piston-rod, cross-head, connecting rod and crank-pin. If the latter weight is used, the machine will be more out of balance vertically than if no weight at all was used, therefore the best result is obtained by taking a weight that over-balances vertically and under-balances horizontally. As the engine is out of balance vertically, the result is that the track is subjected to a series of shocks, detrimental to the roadbed and bridges.

Wm. Baxter, Jr., in an able article recently published in the *Electrical Engineer*, in comparing the efficiency of the tests obtained from the engine drawing the Empire State Express on the New York Central Railroad, states "they have shown results as high as three and one-fourth pounds of coal per horse-power per hour, but the conditions under which such tests have to be made are such that it is very difficult, if not actually impossible, to obtain exact results. The power developed by locomotives, as shown by the indicator cards, can be considerably out of the way. This fact is recognized by steam railroad engineers, and few, if any, of them would undertake to claim that the results of these tests represent the average working efficiency of locomotives in high-speed service. It is very doubtful whether the average every-day work of high-speed passenger locomotives can show a result much below four pounds per horse-power hour. We can assume that the coal consumption of a locomotive will average, in actual service, about four pounds per horse-power hour for express engines, five pounds for local passenger and six pounds for freight. There is another class of work for which locomotives are used, in which the coal consumption per horse-power of useful work performed is very great; just how much, it is impossible to say, but in all probability it is in the neighborhood of 20 pounds per horse-power hour, and in some cases may go even higher. The work referred to is that of drill engines. Of course, these engines can not be taken into consideration in an estimate of the relative efficiency of locomotives and electric motors, because their wastefulness is due to the fact that, while they are burning coal all the time, they are only developing horse-power for short periods at a time.

"The average efficiency of large stationary engines is conceded to be about two pounds or less of coal per horse-power hour. The data presented in the foregoing sustain the claim that the substitution of electricity for steam would effect a saving of about 55 per cent of the coal bill. The saving of coal alone, however, is not the all-important factor upon which hangs the future destiny of electricity in the steam railway field. In the first place, we have the very important fact that the electric motor does not depend upon the skill of the man who handles it for its efficiency, while the locomotive does. No matter what the intelligence of the motorman may be, the energy absorbed in doing a given amount of work with the same motor will always be the same. This is by no means the case with the locomotive. There are two ways by which the speed of the locomotive can be regulated—one by the movement of the link-motion lever, the other by opening and closing the throttle. If the link-motion lever is used, the steam will be expanded in the cylinders and the highest efficiency obtained. By using the link motion, the throw of the valve is shortened in precisely the same way as it is in the various types of high-speed engines that have a single valve, the motion of which is regulated by the governor. Under these conditions the locomotive becomes a variable cut-off engine, and works at a high rate of efficiency, but when the throttle is used to regulate the speed, it become simply a slide valve engine, and uses a much greater amount of steam to do the same work.

The amount of coal used to generate steam will further depend upon the skill and care of the fireman. This is one point in which steam is at a decided disadvantage when compared with electricity. It may be said that what is true of the locomotive is true of the engine at the power-station of the electric system, but such is not the case. The engines regulate themselves by the action of the governor, and so far as the efficient use of steam is concerned they are no more dependent upon the skill of the engineer than the motor is. As to the wastefulness of the engineer and fireman, it is not at all likely to be as great at a central station as on a locomotive.

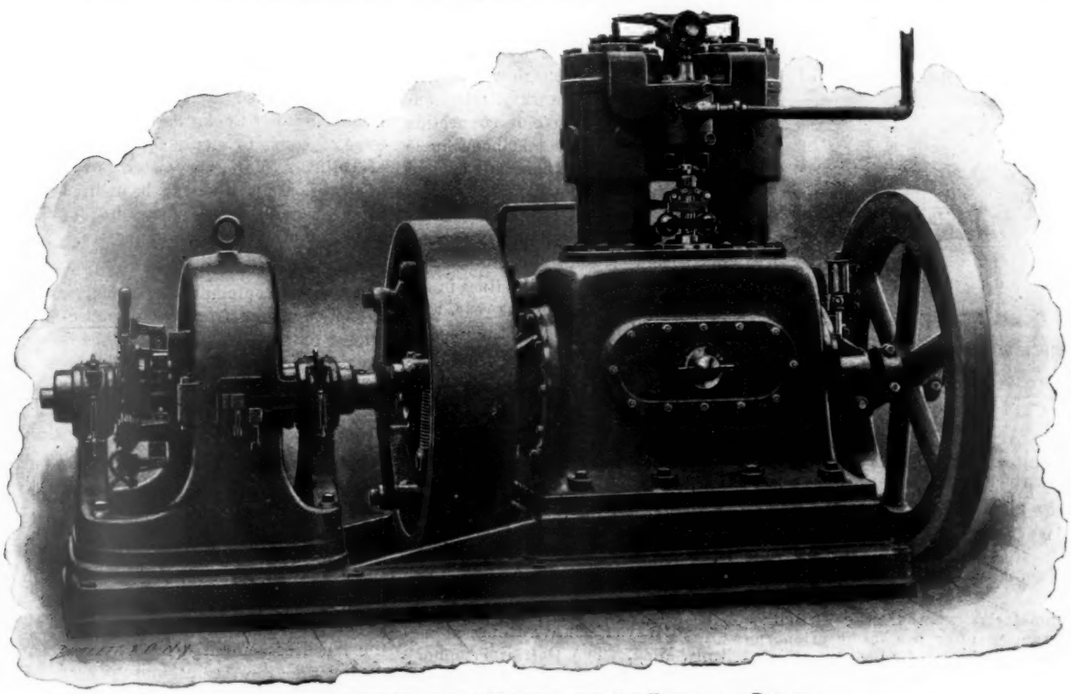
Many of the large railroad companies introduced into their motive departments a system of rewards for the economical use of coal and engine supplies, but I understand that that system proved a failure from the fact that the engineers and firemen, in their zeal to get the coveted rewards, frequently preyed upon one another, and often were so economical as not to use sufficient fuel to enable them to make their running time.

Now, in a central station, where everything is under the watchful eye of a capable and efficient engineer, and with the automatic mechanical stoking apparatus now at hand and adequate facilities for handling coal, and all other conveniences which go to make up a well equipped central station, unnecessary leakages can not long exist.

(To be concluded.)

The Westinghouse Gas Engine.

The Westinghouse Machine Company, of Pittsburgh, have just placed upon the market the Westinghouse gas engine, which they are prepared to furnish in all sizes from five horse-power to 500 horse-power. As will be seen from the accompanying illustration, the new gas engine is similar in some respects to the well known Westinghouse steam engine. The gas engines have been put through thorough tests and trials before placing them on the market, and the manufacturers state that the apparatus they now offer is equal in perfection to the Westinghouse steam engine. For this line of gas engines the manufacturers have established a commercial rating which bears about the same relation to the ultimate brake horse-power as the rated capacity of the steam engine bears to its ultimate capacity; that is, the rating represents from 80 to 85 per cent of the total maximum brake horse-power developed on the test.



Direct-Connected Westinghouse Gas Engine and Dynamo.

In the smaller sizes of the Westinghouse gas engines there are two cylinders, and in the larger sizes three, cast of a special mixture of hard, fine-grained iron, bored and finished with the highest degree of accuracy. The pistons are of the trunk pattern, backed with cast-iron spring-rings, and carrying a case-hardened steel wrist-pin accurately ground to size, with which the upper end of the connecting rod engages. The connecting rods are forged from steel, and the adjustment of the piston end has been provided for in a very convenient manner. The shaft is made from the best quality of steel, the cranks being forged solid and slotted out. The bearings are all adjustable, the lower halves being set up by wedges operated by screws. This insures the proper alignment of the shaft after each adjustment; and, where the engine is direct-connected to a dynamo, this feature is especially desirable, as it preserves the height, from the base of the engine to the center of the shaft, as a constant.

The explosive mixture used in this gas engine is ignited by means of an electric spark. The igniters are simple in construction, durable, and mounted in small castings, easily removed and replaced. In sizes from 15 horse-power upwards there are double igniters in each cylinder. One of these is in operation and the other is held in reserve. In case of accident to the igniter in service, the battery wire can be instantly shifted to the binding post of the reserve igniter and the engine may be kept in service until it can be examined. The lubrication is of the regular Westinghouse order, effecting great economy in the use of oil.

Small gas engines are easily set in operation by giving the flywheel several turns by hand until the charge of gas and air has been drawn in, compressed and exploded. With the Westinghouse engines too large to be readily started by hand, a simple and effective air compressor and an air-storage tank of ample capacity are supplied. An ingenious arrangement in connection with this compressed air apparatus converts one cylinder of the gas engine into a compressed air motor without disturbing the functions of the other cylinder or cylinders, by which means the engine starts up and continues to run on an air pressure until explosion takes place in the other cylinder. This process is strictly automatic. The methods of regulation are of the most approved and modern type, and the makers state that for smooth running and steady speed the Westinghouse gas engine is equaled only by the best steam engines. These engines are built to run on gas of any kind or quality or on gasoline, as may be desired.

Negotiations for consolidation of the Brooklyn, N. Y., Traction Companies are still pending. It is stated on good authority that substantial progress is being made, but matters have not proceeded far enough yet to warrant publication of details.

Changes in the West Park Lighting Plant, Chicago.

The $200,000 lighting plant recently erected by the West Park Board, Chicago, is to be "put in order," and the taxpayers will have to pay an additional sum of from $35,000 to $75,000. Just what putting it in order means, and just what the changes will cost, seems not yet definitely decided upon. Some electrical engineers claim the most sensible thing to do would be to rip out the old plant and put in new machinery. The report of Alex. Dow, consulting engineer of Detroit, who examined and tested the plant a month ago, has not yet been made public and it will not be until August 1, when, coupled with its publication, will be a definite announcement as to which of Mr. Dow's recommendations of changes the board will adopt. The dynamos, consulting engineer Forée Bain says, are not built according to specifications, and will probably have to be changed. The lamp-posts, with their creosoted wooden sections, do not seem to be sufficiently insulated, and will, no doubt, have to be replaced. The system of rope transmission seems quite a bone of contention among engineers. It is said to be entirely inadequate to do the work, and was insisted on, according to Mr. Bain, because it was $200 cheaper than belting. There are a number of other alleged defects, and it is said that only one or two of the contractors have been fully settled with.

"I do not hesitate to say that we will have to make some large changes," President Suddard is quoted as saying. "I want to be fair with everybody and not throw out any man's machine unless necessary. But the plant does not perform its work. The dynamos must come out, and also, I think, the rope drive. I am not yet prepared to say what the necessary changes will cost. I hope it may not exceed $35,000, but it may be more."

NEWS FROM THE WEST.

General Superintendent L. A. Ferguson, of the Chicago Edison Company, has so far recovered from his recent illness as to be able to be around the office, and will no doubt soon attend regularly to business with his usual energy.

J. Holt Gates, western agent of the Walker Company, has been obliged to move into larger and more suitable offices at suite 1323–1324 Marquette Building, Chicago. Mr. Gates reports that he has taken the western agency for the well known Wagner transformers, single-phase, alternating-current motors, switchboard instruments and switches. In addition, Mr. Gates will handle the slow-speed dynamos and motors of the Card Electric Company, of Mansfield, Ohio. Business, Mr. Gates says, is good, with indications of still further improvement.

The Western Telephone Construction Company, Chicago, reports that in spite of the usual midsummer quiet in all lines of business, orders for exchange apparatus are coming in gratifying numbers. Sheridan, Wyo., and Pinckneyville, Ill., are among the more important towns recently equipped, besides a large number of smaller exchanges. President J. E. Keelyn has taken his family East on a recreation trip, and, while there, will devote a few days to the final details of some important business deals, which we are told will cause no little surprise to outsiders.

The Stromberg-Carlson Telephone Manufacturing Company, Chicago, is experiencing quite a rush of orders for additional equipments to existing exchanges, in addition to the many new places recently furnished with apparatus made by that well known concern. Among the towns lately equipped are these: Sullivan, Ind., Pontiac, Ill., Oxford, Ind., Granville, Ill., Spring Valley, Ill., Fairbury, Ill., Albany, Tex. The Illinois State Penitentiary has also been equipped with an exchange system, and the St. Elizabeth Hospital, Chicago, is so well pleased with its express system that it paid the bill before it was really due. The company is also equipping the Scott Block, at Erie, Pa., the offices of the Pennsylvania lines, at Pittsburgh, and is re-equipping the Tuscola, Ill., exchange. Taking all in all, the Stromberg-Carlson company says it has no reason to complain.

The electric lighting plant at the Cape Town, South Africa, railway station is being considerably extended and improved. New boilers are being installed, which will bring the horse-power up to 1,500, and arrangements are being made to light all government buildings from this source. The Houses of Parliament have already been connected with this service.

Brown Brothers & Company announce that their issue of $4,000,000 United Traction five per cent bonds of Pittsburgh has been over-subscribed for, and that the subscription books are therefore closed.

Roentgen's Latest Experiments.

[*From the London Lancet.*]

Professor Roentgen has again made a communication to the Royal Academy of Sciences on his great discovery. He states that while the X rays are passing through the air they traverse it in every direction. When a plate impervious to the rays is placed between a fluorescent screen and a source of the rays, so that the screen is overshadowed by the plate, the platinocyanide of barium nevertheless becomes luminous, and this luminosity is visible even when the screen lies directly upon the plate, so that one might imagine that some rays had traversed the plate; but if the screen placed on the plate is covered by a thick piece of glass, the fluorescence becomes weaker and disappears completely when the glass is replaced by a cylinder of lead 0.1 centimeter (equals one twenty-fifth of an inch) in thickness surrounding the fluorescent screen. Professor Roentgen's explanation of this phenomenon is that X rays emanate from the irradiated air. He considers that if our eyes were as sensible to the X rays as to ordinary light, the appearance would be as if a candle were burning in a room filled with tobacco smoke. Professor Roentgen has, moreover, invented a new apparatus for measuring the intensity of the X rays.

He has succeeded in ascertaining, by means of this apparatus, that the intensity of the rays is influenced: (1) by the course of the primary current; (2) by the interposition of a Tesla transformer; (3) by the rarefaction of the air in the tube; and (4) by some other agencies not yet known. He concludes: (1) that the rays issuing from a discharging apparatus consist of a mixture of rays of different absorbability and intensity; (2) that the combination principally depends on the course of the discharging current; (3) that the absorption of the rays varies according to the absorbing medium; and (4) that as the X rays are produced by the cathode rays, and have similar fluorescent, photographic and electrical qualities, it is very probable that they are both phenomena of the same nature.

LITERARY.

For a young college graduate to start out without a cent in his pocket and earn his living for two years as an unskilled laborer, is a striking achievement. Walter A. Wyckoff begins his narrative of this feat in the August *Scribner's*, under the title "The Workers—An Experiment in Reality." It promises to be the first presentation of the American workingman as he is to-day—not as an economic problem, but as a human being, making what he can of the conditions which the republic offers him. It is the real thing and not manufactured adventures.

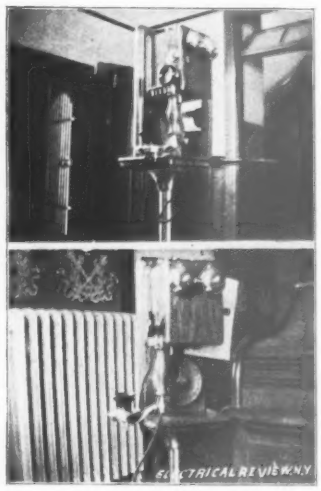
There has been an almost unprecedented demand for fan motors with the rather sudden arrival of the dog days, and the Central Electric Company, Chicago, has had its facilities taxed to the utmost to keep up its reputation for prompt shipments.

The Wakefield Rattan Company's Telephone System.

The Wakefield Rattan Company has recently installed a telephone system in its factory which possesses several unique features. The installation, which was made by Taber & Mayer, 185 Franklin street, Boston, consists of 20 stations of Magneto signal-battery telephones.

The system is completely intercommunicative, doing away with the necessity of a switchboard or central. The battery is located at one point, three cells being sufficient to operate all the telephones. This obviates the placing of cells under desks, or in places where their appearance may be objectionable.

With the switch used with this system it is entirely unnecessary to replace it to the home point after conversation. This is a great drawback of the ordinary telephone system of this kind. As here arranged it is



FIGS. 1 AND 2.—DESK TELEPHONES—WAKEFIELD RATTAN COMPANY.

immaterial whether the switch is forgotten after use, as is often the case, or is replaced in the usual manner. If it is misplaced, it is only necessary to turn it back in answering the next call.

The illustrations herewith show the instruments as made up for the offices. These are placed conveniently at the end of the desks; all wires and connections are entirely hidden.

Iron Felt.

The United States consul at Chemnitz reports that Berlin and Leipsic are boasting about a new invention, to be known as iron felt. It is made of the very best woolen materials, impregnated with the inventor's patented preparation, which gives it 2,220 pounds' power of resistance to every square centimeter (0.3937 inch). The article is most useful for railroads of all kinds. Placed between rails and sleepers, it deadens sound and prevents shocks. The first experiments with the new material were made by the Berlin City Street Railway, over which 360 trains pass daily. The results surpassed the company's most sanguine expectation. Not only was the noise brought down to a minimum, but the wear and tear was materially diminished. It is to be tried on the new roads in Leipsic. Old buildings, and particularly buildings of stone and iron, suffer most from the shocks and noise of passing trains. Such an insulating material seems to be specially adapted for elevated roads.

TELEPHONE NEWS AND COMMENT.

It is expected that all the telegraph and telephone lines in the city of New Orleans, La., will be soon ordered placed underground.

For the preservation of wooden telegraph poles the Boucherie process of injecting a solution of sulphate of copper into the pores of the wood is said to prolong their lives to about 15 years.

The Mayor and Board of Aldermen of Concord, N. H., have refused the petition of the Concord Telephone Company, an independent company, to establish an exchange in that city in opposition to the New England Telephone and Telegraph Company.

It is claimed that by the first of next January Pittsburgh will be surrounded with a network of telephone wires which will give it connection with at least 20,000 telephones in 35 or 40 towns, all of them independent of the Bell interests.

The telephone system is progressing somewhat slowly in Russia. In 1896 there were 56 public lines in use against 43 in the previous year, with 8,331 subscribers, or, 2.214 more than in 1895. Eleven private lines were working with 10,164 subscribers, showing but a small increase over 1895. Included in the last category are the owners of the large estates and big manufacturers, especially in western Russia and the Baltic provinces.

For some years past the Michigan Bell Telephone Company has received $587 per year for the telephones used at the Wayne County House at Detroit, Mich. The Detroit Telephone Company offered to give the same service for $275. The Michigan people came down to $250 per year, providing the commission would bind themselves for three years. They declined the proposition, but will try and have the old telephones left in at the new price and for a period of one year.

Swan Incandescent Electric Light Company Dissolved.

Judge Russell, of the Supreme Court, last week granted an order dissolving the Swan Incandescent Electric Light Company, of New York city, and appointed Chas. W. Spear, of Mount Vernon, receiver, with a bond of $5,000. The company began proceedings for dissolution in March last, showing assets, $6,900, and no liabilities. Mayor Strong was a director in the company.

KIND WORDS.

THE PAPER FOR HIM.

TO THE EDITOR OF ELECTRICAL REVIEW:

Please find remittance for the REVIEW. The ELECTRICAL REVIEW is the paper for me. I am very much pleased with it.

July 13. C. B. GASKELL.

ELECTRIC RAILWAY NOTES.

The Brooklyn City Railroad Company, of Brooklyn, N. Y., declared a dividend of two and one-half per cent, payable July 15, to stockholders of record of July 10.

The Brooklyn Heights Railroad Company, of Brooklyn, N. Y., has contracted for the purchase of 60 new closed trolley cars, which are to cost $55,000 for the bodies alone.

The New York Stock Exchange has decided not to list the West Chicago Street Railroad securities until after consideration of the application by the next regular meeting of the governing committee, in September.

It is reported that the property of the Atlanta, Ga., Railway Company may be sold to a syndicate of English and eastern capitalists. The purpose of the prospective buyers is to extend the lines of the company and vastly improve the system, it is said.

It is reported that a syndicate headed by Jay Cooke has floated an issue of bonds to secure for the city of Duluth, Minn., the water power of the St. Louis River, to be utilized in the generation of electricity for mills and other industrial purposes.

The Chicago, Ill., City Railway Company is contemplating a change in motive power from cable to electricity for its entire system. It is probable that before Fall the trolley will be strung through State street and Wabash avenue in the downtown district.

The report of the Metropolitan Street Railway system of Kansas City for the year ending May 31, 1897, shows a gross business almost identical with that of the preceding year, the decrease having been $8,587. Net earnings show an increase of $10,643 as compared with last year. Operating expenses amounted to 57.01 per cent of the gross receipts and the cost per car mile was 8.3 cents.

Mayor Harrison, of Chicago, won his fight with his veto power on July 12, and the ordinance permitting the General Electric Railway Company to use the overhead trolley system is dead. It is generally conceded that the General Electric road itself is dead. No one expects it to be built unless conditions greatly change. The "gang" in the City Council is badly split up. Alderman McInerney has put himself up as a rival to Alderman Power for the leadership, and it is felt to be doubtful if the boys can soon be rallied again.

A syndicate of Philadelphia capitalists has just completed arrangements for the purchase of the New York, White Plains & Elmsford Railway and the Citizens' Gas and Electric Company, of White Plains, and also the Port Chester Gas and Electric Company and the Port Chester Railway Company. The whole transaction will involve the transfer of something more than $500,000 in stock, divided as follows: White Plains Gas Company, $150,000; the trolley company, $100,000, and the Port Chester Gas Company, $250,000.

Rushmore's New Arc Dynamo.

All the difficulties that have stood in the way of a successful multi-circuit arc dynamo are claimed to have been overcome by Mr. S. W. Rushmore, of the Rushmore Dynamo Works, Jersey City, N. J., and he has built a machine that will supply

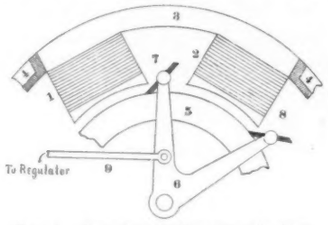


FIG. 1.—SECTION OF RUSHMORE'S NEW ARC DYNAMO.

a number of independent circuits, each automatically regulated from full load to short circuit, thus solving the problem of small machines and belting in large arc stations.

The machine is very simple in construction, and has a large ring armature, surrounded by a multipolar field. The field is somewhat different from the ordinary construction, in that the magnet poles are not secured to a common field ring, as in usual practice, but are arranged in pairs, each pair magnetically separated from the others. The armature and the poles are so proportioned that the section embraced by a single pair of poles will have a sufficient capacity to supply a circuit of arc lamps at the maximum voltage, and thus for each additional circuit the armature is made of greater size, and there will be an additional magnet or pair of poles. In short, it is a number of arc machines incorporated in a single unit, with an armature common to all.

In the first machine, constructed on this plan some years ago, three brushes were employed for each section; one brush between the poles and two brushes outside of the poles, the central brush connected to one side of a circuit and the outer brushes joined together to the other side of the circuit. This arrangement worked very well, so long as the load on the different circuits remained the same, but when it was attempted to greatly vary the number of lights on one circuit, the brushes collecting currents for other circuits under other poles would flash badly, and there was a great falling off in the capacity of the machine.

After studying the matter Mr. Rushmore concluded that the interference of the different sections was due to the current in the armature causing or allowing the flux from one section to flow to the other sections, and he concluded that the trouble would disappear if the armature flux, due to current in each circuit, could be kept within its section, and he therefore arranged the machine with brushes to collect the current from the armature under but a single pole of each pair of magnets, instead of under both poles. In this way it was found that as much current could be collected from a section of the armature under a single pole as under both poles, while the "idle" pole served to keep the flux from flowing to the other sections, and no matter how much current was drawn from the armature under one section or separate magnet, there was no effect upon the other sections, and each section and pair of brushes would supply an independent circuit with varying current or pressure entirely independent of all other sections.

In Fig. 1 is shown a section of the machine with a ring armature with poles 1 and 2 connected by yoke piece 3; 4, 4 are non-magnetic sections joining a magnet with other similar magnets to form a complete field; 5 is a section of the armature and 6 a brush rocker carrying brushes 7 and 8, which are adapted to include between them the armature coils under pole 2; 9 is a bar or lever from a regulator adapted to shift the brushes in the usual manner. When the circuit supplied from the brushes is at its maximum voltage, the brushes will be shifted to a position with the pole 2 nearly central between them, and as lamps are cut out and less voltage is required, the regulator will shift the brushes toward pole 1, thus distorting the field from pole 2 to keep down the voltage, as in bipolar machines.

As the current in the armature under pole 1 is only the very small amount that will find its way around the armature under all the other poles from brush 7 to brush 8, there will be little or no distortion of the field of pole 1, and there will be no interference with the working of the adjacent section, which may be supplying a different circuit.

It has been found that machines constructed on this new principle have very little tendency to flash, and have such wide inherent regulation that very little work is required of the regulator. The machine may be built with a large number of poles to supply as many circuits as desired, and be connected direct to an engine. In appearance it resembles common types of multipolar generators, except that the brushes for each pair of poles are connected to a regulator.

The invention is not limited to arc machines, but may be applied to any service where it is desired to have a single machine supply current at two or more different pressures for lighting, railway work, etc. The machines may be built in large units to deliver their entire output at a single voltage, or at as many different voltages as there are pairs of magnet poles surrounding the armature, and the voltage adjusted instantly to any amount required. Thus one or more sections of the machine may supply the main station bus, while other sections may be connected to feeders and be compounded for any loss desired, thus dispensing with boosters and special high-pressure machines for long feeders.

This is shown in Fig. 2, in which 1, 2 and 3 are switches adapted to cross-connect the brushes so that the current may be collected directly under a single pole of each pair, or under as many poles as desired.

Fig. 3 shows the machine as applied to the three-wire system, in

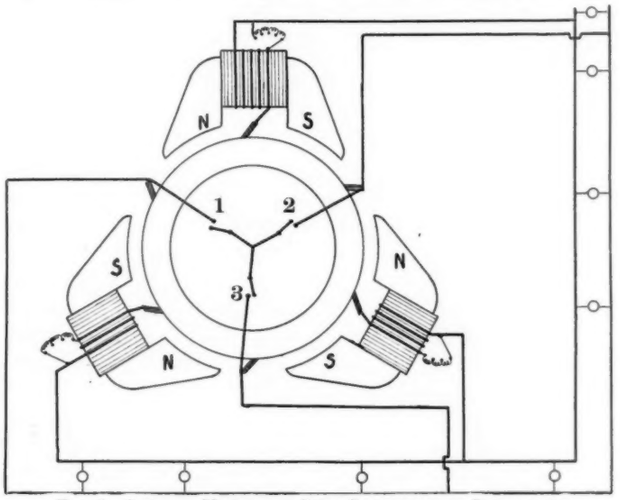


FIG. 2.—SHOWING METHOD OF CROSS-CONNECTION IN RUSHMORE'S NEW ARC DYNAMO.

which case it is practically two machines in series, and the load may be entirely removed from one side of the system without in the least affecting the voltage supplied by the machine to the other side, which may be fully loaded. In Fig. 3, 1 is a switch adapted to connect the brushes so that the current may be collected under other than a single pole of each pair, and this switch would be opened only when the system was so badly out of balance as to make it necessary to collect under one pole as already described.

McClure's Magazine for August will be a midsummer fiction number, with stories by the greatest living writers in that kind. But it will not ignore graver interests. Mr. H. J. W. Dam will describe the daily life and work in the greatest dynamite factory in the world; Anthony Hope, the author of "The Prisoner of Zenda," will give his impressions of C. D. Gibson, the American artist, who, in his drawings, has lately shown the people of London what they are like; Madame Blanc, of the staff of the *Revue des Deux Mondes*, will describe the Paris *gamin*, as she has herself seen him in his native haunts; and Hamlin Garland, drawing upon unpublished original documents and testimony, will tell the story of the first meeting of Lincoln and Grant—a meeting as picturesque and dramatic as it was important.

A Trolley Hold-Up.

[*From Brooklyn Life.*]

The car was bowling along at a merry pace through the murky gloom of a desolate suburb. Not a pedestrian or vehicle was in sight—not even a bicycle. The hour was late—the hour when men, homeward bound, curse the transportation companies and Mr. Raines.

"J'read 'bout that trolley car being held-up the other night by masked men in Chicago?" asked the corpulent chap of his nervous-looking companion.

"Yes; wasn't it shocking? Now, I would have"—Bang! biff! The car came to a sudden stop and from a long, low, rakish wagon abreast of which it had halted sprang a number of darkly clad, evil-visaged men who quickly surrounded the conveyance.

The motorman sank back on the front seat as though sandbagged, he of the nerves hastily swallowed his diamond ring and threw his money and watch from the car, while the darkly clad, evil-visaged men nimbly climbed aloft—and repaired the broken wire.

PERSONAL.

Mr. W. C. Crider, general sales agent for the Washington Carbon Company, was in Chicago for a few days last week, looking after the orders for the coming Fall trade.

Jas. F. (Jim) Cummings, of Armorite Conduit fame, stopped in Chicago last Thursday just long enough to make a few sarcastic remarks about the Summer weather and took the next train for New York.

The genial A. H. Reece, who will be remembered as one of the representative electric light men of the days when arc apparatus sold at $100 per lamp, has for some time past engaged in the business of making things brighter, especially for those who have charge of electric light or

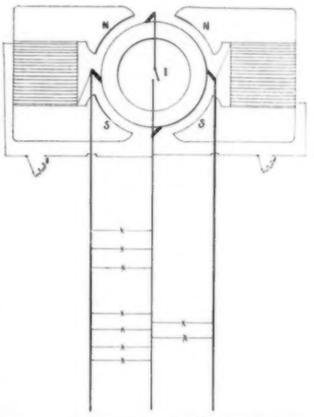


FIG. 3.—RUSHMORE'S NEW ARC DYNAMO APPLIED TO THE THREE-WIRE SYSTEM.

other machinery. Mr. Reece is manager of the Woods Manufacturing Company, Chicago, whose polishing compound, "Solarine," is fast becoming known as the most efficient brightener of all kinds of metals ever produced. Those who have not yet tried this remarkable preparation are urged to send for a sample can to the Woods Manufacturing Company, 80 Market street, Chicago.

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ASSOCIATE EDITOR:
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LONDON OFFICE:
HENRY W. HALL, Representative,
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CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, JULY 21, 1897.

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The convention of the Northwestern Electrical Association, in session this week at La Crosse, Wis., promises to be even more interesting than previous meetings of this body of western hustlers. The association is run on lines similar to the National Electric Light Association, and has proved of undoubted benefit to its members who are drawn from the West and Northwest. A full report of the meeting will appear in next week's ELECTRICAL REVIEW.

What a blessing the telephone is in hot weather! You can sit at your desk, where the electric fan cools you, and transact the larger part of your business without moving or going out into the hot streets. It's great!

The battle between the Bell interests and the independents waxes apace. Recent news from one section of the scene of war describes a personal encounter at Richmond, Va., between the representatives of contesting interests. Mr. Clarence E. Young, representing the Bell company, and John C. Robertson, the antis, became so warm in their arguments that they resorted to fisticuffs. Their friends separated the energetic representatives of these opposing interests before any serious damage was done. We deplore such actions. This is not the line on which to fight it out this hot Summer.

The interest in electric traction is progressing at a great rate among steam railway officials. Several of the journals devoted to steam traffic are also paying considerable attention to electrical matters affecting transportation. The superintendent of a prominent steam railway has just written to us as follows: "I have been for the past year a constant and interested reader of your valuable paper, the ELECTRICAL REVIEW. In these days of progress, especially in the rapid development of electric traction, as applied to short steam railroads, steam railroad officials will find, in the perusal of the REVIEW, matter highly interesting and in keeping with the spirit and progress of the times."

"Silent as a ghost" was the expression recently used by an intelligent engineer in describing the workings of an engine that had been in continuous operation 24 hours a day for 15 months, without having had a wrench even near it. Incredible as such a record may seem, it is vouched for by a well known engine builder of Chicago, whose veracity is unquestioned. "Such cases may be rare," said the engine builder, "but they would be of far more frequent occurrence if we had more such engineers as the one who has charge of this particular plant. He believes in letting an engine that is doing good work alone, and does not, like so many of his craft, imagine a nut needs tightening, or a key taken up just because the engine has run a month or two months. It is not always the engine that needs looking after—much oftener it is the engineer."

TELEPHONES IN ALASKA.

The wonderful reports of the rich gold finds in the Klondike fields in Alaska have kept the public interest at a high pitch during the past week. While the gold fields are very difficult of access, yet plans are already on foot to provide the several mining camps with many of the necessities and luxuries of civilization. One of the earliest prospectors, Joe Ladue, who founded Dawson City, is on his way East. He says that when he goes back to Alaska next Spring he will carry with him a number of telephones, which will be used to facilitate communication between Dawson City, Forty Mile and Circle City. The mining camp proper will also be connected with Dawson City. In a country where day laborers command wages of $15 a day, what will the telephone charges be?

LATE NEWS.

Elmer H. See, an electrician, died at his home in Elizabeth, N. J., on July 18, at the age of 40. He had recently undergone a surgical operation.

Mr. James E. Keelyn, of Chicago, President of the Western Telephone Construction Company, is spending the hot days at Asbury Park, N. J., with his family.

Columbus R. Cummings, a prominent and wealthy Chicago man, died on July 12. He was a stockholder and director in the Central Union Telephone Company, and was largely interested in street railway companies.

At the monthly meeting of the Albany, N. Y., Railway Company, one and one-half per cent quarterly, and an extra one per cent dividend on the stock, both payable August 2 to stockholders of record July 22, were declared.

A press dispatch from the city of Mexico, dated July 17, states that a few days ago a telephone wire was cut near Tacubaya. The offender has been captured and will be shot, as the Mexican law prescribes that punishment for such offenses.

It is stated that never before in the history of the copper trade has there been so great an addition to the product of any country as that witnessed during 1896 in the United States, the increase over the preceding year having been nearly 80,000,000 pounds.

The demand for Metropolitan Street Railway fives clearly indicates how anxious capital is to invest in a security of known value. The subscription of $50,000,000 to the new fives is one of the most successful transactions the Street has ever seen, and the reason for the large subscriptions is apparent from the demand for the bonds at high prices. The syndicate offered the bonds at 105, and $80,000 of them sold in the Street, in three blocks, of $50,000 $25,000 and $5,000, at 111⅜.—*Wall Street Journal.*

An Interesting and Modern Electric Motor Installation.

The use of motors for driving the machinery in shops seems to be making particular headway in the iron and machinery industries. Each day almost bring news of some important installation of the electrical drive in shops of this character, and it is only a few months ago since the most important iron working establishment in Pennsylvania, that at Homestead, was equipped with electric motors. The result of their use is general satisfaction from the superintendent downwards, as well as marked economy compared with methods previously employed.

An interesting example of electric drive in a heavy machinery works is that found in the shops of the Farrel Foundry and Machine Company, at Ansonia, Ct., the electricity being taken from water-driven generators located nearly three miles away.

Previous to the development of the water power, the generating plant of the Farrel Foundry and Machine Company consisted of two 75-kilowatt, six-pole, 275-revolution, 500-volt dynamos, directly coupled to 100-horse-power Ames engines, and one four-pole, 65-kilowatt, 220-volt generator driven by belt. The latter still furnishes current to three traveling cranes; the former, during a short space of time only during the year, drives the different motors scattered throughout the shops. This plant was purchased before the Derby Gas Company arranged with the Farrel Foundry and Machine Company to supply it with current from its power-station at the Housatonic Dam, where it utilizes the excess water flowing over the dam. The Derby company having two four-pole, 200-kilowatt, 550-volt machines, and being thus in a position to supply power, made a favorable arrangement with the Farrel company.

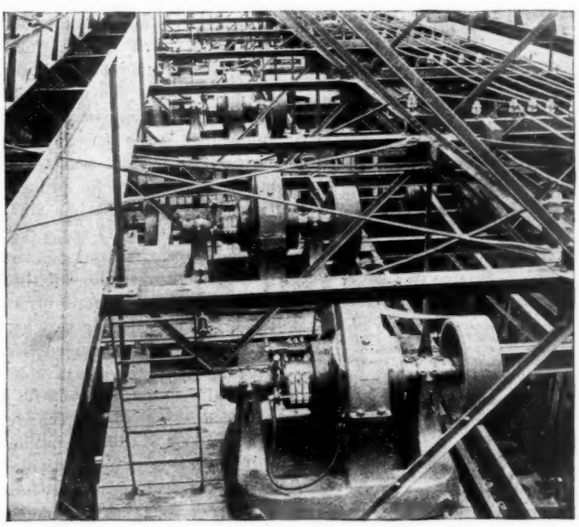
Both dynamos being direct-current machines, and the length of the transmission nearly three miles, they are coupled in series to secure the necessary pressure, and deliver current at the brushes at 1,100 volts. At the switchboard at Ansonia the pressure is 1,000 volts. The distribution is carried out on the Edison three-wire system, and as half the motors in the works are connected to each side of the system, the working pressure of each motor is 500 volts.

In the engine room at Ansonia is a switchboard of the panel type, arranged not only for the complete control of the motor plant operated from Derby, but also for the isolated plant of the Farrel company. The two 75-kilowatt generators in the Farrel works are used for about two months only in the year, the current from the Housatonic being used for the other 10 months. The first two panels control the two 75-kilowatt generators; the third is an "outside supply" panel, and then come 10 panels, each controlling two motors. Each panel carries two motor automatic starting rheostats, with magnetic cut-out, four single-pole double-throw switches, so connected that any motor may be thrown on either side of the three-wire system. An ammeter is in circuit with each motor. The last panel but one on the left is the feeder panel for the three traveling cranes, while the last panel is the generator panel for the 65-kilowatt, 220-volt generator supplying current to the cranes.

The motor equipment consists in all of 19 motors of the following horse-power and speed:

	Horse-power.	Revolutions.
3	35	525
5	10	325
5	15	312

They are all of the four-pole type and for the most part are located directly over the floor of the shop on platform suspended from the roof girders. From these the belts are taken to the shafting below, whence the various machines are driven. The illustration shows six motors set on platforms, in the new machine shop. They range in capacity from 10 to 35 horse-power. Directly beneath them is the path of one of the traveling cranes. Other motors are attached to the wall and a few are on the main floor near the walls.



Six 500-Volt Motors Attached to Roof Girders in Machine Shop.

The machinery manufactured by the Farrel Foundry and Machine Company is of a peculiarly heavy type, and the machines driven by the motors are of various characters and sizes, subjected to sudden heavy and fluctuating loads; yet, according to the officers of the Farrel company, the plant, running since October, 1895, has not only given complete satisfaction, but no repairs either to generators or motors have been found necessary during the 18 months in which the system of electrical drive has been in operation. The heavy ore and rock crushers made by the Farrel company are used in all parts of the world, while their mills and heavy calender rolls are found in nearly every rubber mill in the United States.

The economy induced by the introduction of the electric motors is, perhaps, best illustrated by the result obtained in the roll shop. This was previously run by a 250-horse-power Buckeye engine, usually loaded to its full capacity. The same rolling machinery, as well as a variety of other machinery, is now driven by motors taking a total power of from 125 horse-power to 150 horse-power.

The 65-kilowatt 250-volt generator supplies, as stated above, the current to operate three traveling cranes and several job cranes. The machine is also subjected to very wide fluctuations of load, sometimes extremely severe. Under service of this character, the ordinary generator might be expected to give some dissatisfaction; yet it operates without the least sparking and without necessity of changing the brushes, under any change of load. The entire electrical plant was furnished by the General Electric Company, of Schenectady.

Some Storage Battery Contracts.

It is a significant fact that the largest users of storage batteries are those who have given the subject of their manufacture and application the greatest amount of study. Four of the Edison illuminating companies, equipped with chloride accumulators, have contracted for duplicate plants; i. e., New York, Brooklyn, Boston (three installations) and Lawrence, Mass.

About a year ago a battery of chloride accumulators was installed in the New York Custom House for the purpose of furnishing current for 12 hours per day when the dynamos were shut down. A contract has just been closed by the Electric Storage Battery Company for a second plant, to be installed in the New York Custom House, to be used for maintaining the night lamps in the Sub-Treasury and the Assay Office.

Other contracts recently closed cover batteries of chloride accumulators for the San Francisco Gas and Electric Company, the Criminal Court Building, the Commercial Cable Building, the Queens Insurance Building, New York; the State Mutual Assurance Company's new building at Worcester, Mass.; and Messrs. Smith & Wesson, Springfield, Mass.

The installation of two batteries of large capacities has just been completed for the Consolidated Traction Company of Pittsburgh, where they are used for regulation and maintaining the potential on their trolley lines, and the Barre & Montpelier, Vt., Railway Company has just contracted for a battery for regulation.

The Postal Telegraph and Cable Company are installing chloride accumulators in their offices at Albuquerque, N. M., and El Paso, Tex. Among the yachts which have been equipped with chloride accumulators this year are: "Embla," "Alicia," "Sapphire," "Clermont," "Pioneer," "New Hiawatha," "Manetta," "Punjaub," "Raynham," "Althea" and "Satanella."

The Electric Rectifying and Refining Company.

The Electric Rectifying and Refining Company, the stock of which has recently been listed in the unlisted department of the Philadelphia Stock Exchange, owns and controls a series of patents granted to Marshal Pridham, of Philadelphia, covering processes and apparatus for the filtration, purification and complete sterilization of water by the application of ozone and electricity; also for the refining of sugars, syrups, oils, etc., and the rectifying and maturing of alcoholic productions.

The company is incorporated under the laws of New Jersey, with a capital of $10,000,000, divided into 100,000 shares of $100 each. The officers are: President, A. Bonzano; vice-president, George A. Pridham; treasurer, Albert L. Williams; secretary, William A. Mears. The board of directors, in addition to the above-named gentlemen, comprises J. William McKinley, of Washington, D. C., Thomas P. Curley, of Camden, N. J., and John Wiseman, of Philadelphia. The company has a proposition before the city authorities of Cumberland, Md., for the erection of a plant (with a capacity of 6,000,000 gallons daily) for the filtration of that city's water supply.

The Street-Car Industry.

A financial paper quotes an officer of the J. G. Brill Company, of Philadelphia, as follows:

"The works are running full time with entire complement of hands. We have about a month's business in hand. In July, 1896, the company was turning out as much work as it is to-day, and business for the year up to that time had been better, but business dropped off rapidly from that date; we have now more business on our books than then.

"Materials, including glass and paint, have advanced in price in the last 10 days. Street cars never will be any higher because of the large building capacity; where there were three or four concerns building street cars 15 years ago there are now 37.

"Most of the business in the market is new equipment for old roads, and does not represent speculative enterprises. I have seen in print that 78 new roads have been incorporated in this country in 1897. A few years ago as many as that would be incorporated in a single day."

The Constitution of the Independent Telephone Association.

The full text of the constitution adopted by the recent convention of independent telephone men at Detroit, is as follows:

ARTICLE I—NAME.

The name of this organization shall be the Independent Telephone Association of the United States of America.

ARTICLE II—OBJECT.

The objects of this association shall be:

1. The protection of all independent telephone interests of common concern to the members of the association.

2. The protection of subscribers to telephones and apparatus operated by members of this association.

3. The bringing about a reasonable charge for tolls and the rental of telephones, so that the telephone may be within the reach of the masses of people.

4. The bringing about a complete system of intermunicipal communication and long-distance trunk lines.

ARTICLE III—MEMBERSHIP.

Any corporation, partnership or individual engaged in the operation of an independent telephone exchange, toll line or system, may become a member of this association by complying with the following conditions:

1. The payment of a membership fee of $10, and the first assessment levied as hereinafter provided; provided, however, that the payment of the membership fee and signing the constitution only shall entitle the member so paying to vote in the election of officers, upon the adoption of this constitution, but not thereafter.

2. The payment, from time to time, of such further assessments as the association, through its proper committee, may levy, not to exceed in any one year 50 cents for each telephone in use by any exchange or toll line company, and 25 cents per mile of pole lines, carrying a wire or wires, over which paid messages are transmitted.

3. Any corporation, partnership or individual engaged in the manufacture or sale of apparatus or materials used in the construction, operation or maintenance of an independent telephone exchange, toll line or system, may be called upon by the advisory board for such voluntary contribution as in the judgment of said board may be equitable and necessary, and upon payment of the same shall, at the option of the contributing party, be made an honorary member of the association. The secretary shall make monthly report to the president, the advisory board and the executive committee, and an annual report to the association, of the persons, firms or corporations entitled to honorary membership under the provisions of this article, and the amount contributed by each. The receipt of the secretary shall be the certificate of such membership, but honorary members shall have no voice in transacting the business of the association, as a matter of right.

4. By subscribing to the constitution and by-laws of the association.

ARTICLE IV—OFFICERS.

The officers of this association shall be a president, three vice-presidents, a secretary, two assistant secretaries, a treasurer and an advisory board consisting of nine members, two of whom shall be the president and secretary of this association, together with seven members who shall be selected by the executive committee. The president and secretary of the association shall be ex-officio chairman and secretary of the advisory board and executive committee, respectively.

ARTICLE V—COMMITTEES.

The association shall elect an executive committee, which shall consist of two members from each State, each State, through its delegates, to suggest the names of the members of said committee to represent such State. Should any State be without representation in the convention, the convention shall then select two members from such State, who shall act until the vacancy shall be properly filled under this Article. The executive committee shall, with the consent of the advisory board, select such sub-committees as it deems expedient and necessary, and shall fully empower such sub-committees to carry out the objects for which they were created.

ARTICLE VI—ELECTION OF OFFICERS.

The officers herein provided for, except the advisory board, shall be elected as provided in Article XIV hereof, on the adoption of this constitution, and thereafter at the regular annual meeting of the association, to be held in June of each year. The time and place of holding such annual meeting shall be fixed by the executive committee. The officers so elected shall serve until the next succeeding annual meeting, or until their successors are elected and qualified.

ARTICLE VII—DUTIES OF OFFICERS.

1. The president shall preside at all meetings of the association, advisory board and executive committee. He shall, under the direction of the advisory board, conduct a bureau of information for the benefit of members of this association, and shall, with the assistance of the advisory board, collect all data and information relating to the welfare and promotion of independent telephone interests. He shall procure facts and evidence tending to the protection and promotion of such interests. He shall have power to call to his assistance for consultation the officers committees and members of this association. He shall approve and countersign all orders drawn on the treasurer of the said association; shall approve and sign all contracts and bonds made by this association; shall approve all bonds made to this association, and be custodian of the same, and shall perform such other duties as naturally devolve upon his office. He shall receive such salary, not to exceed $2,500 per year, as the executive committee shall fix; shall have an allowance for expenses, to be paid upon approval of the advisory board on presentation of properly executed vouchers. His salary shall be paid at the end of each quarter by draft made on the treasurer. He shall give bond in such sum as the executive committee may require, with such security as may be approved by the advisory board.

2. Vice-presidents: The vice-presidents shall rank first, second and third, according to the choice of the association, to be designated at the time of their election, and shall, in their order, perform the duties of the president so far as they relate to meetings of the whole association only, in the absence or inability of the president to act, and shall have an allowance for actual expenses while performing said duties, upon the approval of the advisory board.

3. The secretary shall keep the minutes of the association; he shall collect all moneys, receipt for the same, and turn the same over to the treasurer promptly, and take his receipt therefor; he shall keep an accurate account of all receipts and expenditures of money, and make a report at each annual meeting of the association, and to the executive committee and advisory board, whenever called upon so to do; he shall issue and mail all official calls, and perform all other duties required of him by the association; he shall receive such salary, not to exceed $1,000 per year, as may be fixed by the executive committee, and shall have an allowance for expenses, to be paid upon the approval of the advisory board, on presentation of properly executed vouchers; his salary shall be paid at the end of each quarter by draft upon the treasurer; he shall give bond in such sum as the executive committee may require, with security, to be approved by the advisory board.

4. The assistant secretaries shall rank first and second, according to the choice of the association, and shall, in their order, perform the duties of the secretary in his absence or inability, and perform such other duties as the secretary may require of them, but shall not be members nor act as secretary of the advisory board; they shall have such compensation as the advisory board may designate, and an allowance for actual expenses while performing the duties of their office, to be approved by the advisory board, upon presentation of properly executed vouchers.

5. The treasurer shall receive from the secretary all money by him collected, acknowledge receipt thereof and pay all properly executed orders and drafts, provided for in this constitution, and all other orders signed by the secretary and countersigned by the president, under the direction of the advisory board. He shall keep an accurate account of all moneys received and disbursed, and make an annual statement of the same to the association, and an itemized statement thereof to the advisory board at any time when he may be called upon so to do. He shall receive such salary, not to exceed $750 per annum, as may be fixed by the executive committee, and shall have an allowance for his actual expenses, after the approval of the advisory board upon presentation of properly executed vouchers. His salary shall be payable at the end of each quarter, by draft upon himself as treasurer. He shall give bond in such sum as may be required by the executive committee, with security to be approved by the advisory board.

6. Advisory board: The advisory board shall have full power to determine all questions, transact all business of the association at all times when the association or the executive committee are not in session; but shall carry out the policy adopted by the association, or the executive committee, unless, in the opinion of the advisory board, circumstances make a change of policy desirable. The advisory board shall direct the finances of the association, shall have full power to levy assessments whenever necessary, subject to the limitations contained in Article III, and to appropriate money in the general fund to such use as, in its judgment, is essential to the welfare of the association. It shall create two funds in the hands of the treasurer; first, a fund for salaries and expenses of officers and committees; second, a general fund; and shall have power to transfer money from one fund to the other without interfering with existing obligations. It shall contract for the association, and shall at all times, except when the association or executive committee is in session, direct the other officers of the association to carry out the intention of this organization.

7. The executive committee shall have all the power of the association, except when said association is in session, not herein especially delegated to the officers and advisory board, and shall have an allowance for their actual expenses incurred in attending meetings of the executive committee, after presentation of properly executed vouchers, upon approval of the advisory board.

ARTICLE VIII—REPRESENTATION.

Each member of this association shall be entitled to one vote for each 500 telephones or less, or for each 500 miles of toll line or less, in actual use, and one additional vote for a major fraction of 500 telephones or miles of toll line in actual use, and no more, on the election of officers or as to any question voted upon by said association.

ARTICLE IX—QUORUM.

A majority of all members present shall constitute a quorum for the transaction of business of this association, 20 days' written notice of the time and place of holding the meeting having first been mailed by the secretary to each member of the association.

ARTICLE X—EXECUTIVE COMMITTEE QUORUM.

Ten or more members of the executive committee shall constitute a quorum for the transaction of business, 10 days' written notice of the time and place of the meeting having first been mailed by the secretary to the address of each member of the committee.

ARTICLE XI—ADVISORY BOARD QUORUM.

A majority of the members of the advisory board shall constitute a quorum for the transaction of business.

ARTICLE XII—SPECIAL MEETINGS.

The advisory board shall, whenever in its opinion the same is desirable, through its president and secretary, call special meetings of the association or the executive committee, at such times and places as it shall designate, and a special meeting of the executive committee shall be called by the secretary upon the written request of three members of said committee, stating the object for which the committee is called, filed with the secretary at least 20 days prior to such meeting. The secretary shall thereupon notify each member in writing of the time and place of holding the meeting, and shall mail to each member a copy of the request for the same. A special meeting of the association may be called upon a written request therefor, stating the object for which the meeting is called, being filed with the secretary, when signed by not less than 100 members of the association. The secretary shall give 10 days' written notice of the time and place of holding such meeting, and shall mail to each member of the association a copy of the call for the same.

ARTICLE XIII—SPECIAL SERVICES.

Any member of this association who shall perform special services under the direction of the association, executive committee or advisory board, shall be allowed such compensation and allowance for expenses as shall be approved by the advisory board.

ARTICLE XIV—ELECTIONS.

The election of officers shall be by ballot whenever two or more names are presented for the same office, and shall be conducted by three judges and two clerks, to be selected by the presiding officer. The presiding judge shall announce the name of the voter before the ballot is deposited in the ballot box; and, should any member challenge the vote, the judges shall then proceed to hear the objection, and shall determine the rights of the voter. Members may vote by written proxy, duly authorizing another member or representative of a member to cast the ballot.

ARTICLE XV—AMENDMENTS.

This constitution may be amended at any regular meeting by an affirmative vote of a majority of all the members of the association, and at any special meeting called for that purpose, the object having been stated in the call, upon the vote of two-thirds of the members present, the proposed amendment or amendments having been first signed by not less than 25 members and filed with the secretary at least 30 days before said meeting, written notice of such proposed amendment or amendments having been mailed by the secretary to each member of the association at least 20 days prior to such meeting.

WHY SOME LIGHTING PLANTS DO NOT PAY.

READ BEFORE THE CANADIAN ELECTRICAL ASSOCIATION, NIAGARA FALLS, ONT., JUNE 2, 1897, BY F. C. ARMSTRONG.

(*Concluded from page 8.*)

Involved in the foregoing, at least by inference, is of course the conclusion that the wasted capital represented in the balance sheets of most companies by obsolete and discarded plant, bought at the high prices of the early days, should be wiped out—if not by the summary process of reduction in capital stock, at any rate in so far as it affects a reasonable and just decision as to the profitable nature of the field offered by electric lighting under the conditions which obtain to-day.

Having thus defined the standard by which we may judge whether a lighting plant pays, we may now indicate briefly some of the causes of failure to realize the modest basis of earning power which we have set forth, and which is the very lowest which can be regarded as satisfactory. The matter is too large for proper treatment within the limits of a convention paper, even with its scope restricted by leaving entirely out of consideration the central stations of the larger cities. I shall therefore only attempt to suggest by touching very generally on some of the more evident cases and causes of failure, a set of conditions the real root and remedy for which will be apparent to the experience of the members of this association.

The subject naturally divides itself into two sections: the one, failure by reason of mistakes in management and business methods; the other, failure through mistakes in engineering and the actual operation of the plant itself. In the first, a sufficient cause for the non-success of the enterprise is often found in the *personnel* of the management. In this respect central stations are of five classes: the first, those which are in charge of a manager or superintendent who may be specially trained for the work, and who devotes his attention exclusively to it; in the second place, those whose management is in the hands of a man who divides his time between it and his other business interest; the next is the large class of small stations which manage themselves, with occasional interference on part of the owner; in the fourth place, and I say it with due deference, we have the lighting stations which are run as appendages to a gas plant, by a gas manager, and which, treated with the care and indulgence which fall to the lot of a necessary evil, make precisely the return on the investment which might be expected. There are notable and happy exceptions, but I regret to say that the rule with this class of station is as I have stated. Finally, we have that Ishmael amongst lighting stations, which its enemies say always, and its exponents say never, comes under the caption of this paper. I mean the municipal plant. In it we have quite often an ingenious combination of all possible methods of mismanagement.

Speaking generally on this point, it will, I think, be admitted that there is to-day no industry, representing an equivalent money investment and possibility of public service, which is so generally managed by men who know little or nothing about it. But the special knowledge and training which comes with experience is in a new business not readily obtainable. The ideal manager will come with time; some of him is here to-day.

The electric light is a manufactured commodity offered for sale to the public; for it there exists in each community a certain possible maximum sale; and with it, to a greater degree than with most other manufactured products, the cost of production per unit is reduced as the output is increased. The question of rates is therefore an all-important one in deciding the earning power of an electric-lighting plant. I will venture the assertion that in most flagrant cases of plants which positively refuse to show any margin on the right side between gross revenue and operating expense, the remedy lies in cutting down the rates to the point which will force a large increase in the business. A plant which supplies 200 lights at $10 each per annum has a revenue of $2,000 per annum and may not pay; the same plant, if increased to 1,000 lights at $5 per annum would probably be paying handsomely.

It is evident also that, like the telephone, central-station electric lighting is a natural, and, when conducted upon proper lines, a beneficial, monopoly. The supply of current for lighting and power within a certain area can unquestionably be carried on more economically from one than from two or more competing stations. The benefits of such economical production may be shared alike by producer and consumer. When such is the case the security for the investment rests on the soundest possible basis, the rates being brought low enough to realize the fullest development of the business within the prescribed limits, the satisfaction of the public being insured, and plainly no opening for profitable competition being left in dividing up a business which—even when extended to the utmost limits, and therefore carried on under the most favorable conditions—affords only a reasonable profit on the money invested.

In connection with rates and the field for business, the arc-light contract properly comes up for consideration. Its value nowadays to the average station is very doubtful. The development of the incandescent lighting, and more lately the power business, has established a reasonably secure and permanent market for the output of the central station; and to this fact, more than any other, are due the improved conditions now noticeable in the industry. It is, unfortunately, true that a large proportion of the existing investment is, in many cases, represented by dynamos, lamps, poles, lines, etc., which are valueless, except for the purposes of the street-lighting contract; but even under these circumstances it would, in most cases, pay the lighting company far better to devote their energy and plant capacity to a development of their proper and permanent business, adding whatever new capital may be necessary to properly equip them for the purpose, rather than continue their profitless and uncertain tenure of the municipal contract.

Also in connection with rates comes up naturally the question of a meter or contract basis. We are leaving out of view now, of course, the case of the large city plants. While on the face of it, it would seem reasonable that the current for electric lighting should be measured for sale like any other manufactured product, and not sold by bulk and by guess, there

is at bottom a sound reason for the instinctive tendency to continue on the contract basis, noticeable in many plants. The reason is, though, not always clearly understood that a mere measurement of the number of units taken to supply a customer for a given time is not a fair measure of the cost, and therefore of the selling price of the units supplied to him. This rests on the fact that all units do not cost alike. Those produced at 6 P. M., for example, the period of maximum load, cost far more than those supplied at 11, in the main and governing item of charge per unit from capital investment. Accordingly the meter measurement of quantity is not a measurement of value or cost, but only an approximation to them upon an erroneous basis. To meet this discrepancy it has been proposed to install two or more meters to measure current taken at heavy and light-load periods of the plant, a larger discount being given for the latter. The basis of contract rates which is general throughout Ontario really represents this condition fairly well, the shop and business rates being relatively high, and the residence rates low, considering the number of units actually supplied in each case. At the same time it must be recognized that in all cases with the larger, and quite frequently with the smaller plants, especially those supplying a day service, the meter method becomes imperative as being the only method whereby a check can be kept on the consumer for actual lighting supplied. In all cases where meters are used a meter rental should be charged, and a minimum monthly charge for each lamp installed provided for in the contract. Otherwise we frequently find a large part of the lamps connected to a central station, to provide for which a continuous charge on account of capital is going on, returning nothing whatever in the way of earnings for months at a time, and then coming in for the most favored customer treatment of the largest consumer.

Another point in connection with the relationship of the central station and the customer is the basis upon which wiring of consumers' premises is done. The vicious principle of free wiring has been practically frowned out of existence, but one equally mischievous has in some instances taken its place—that the wiring department should be conducted at a handsome profit. The correct principle is, of course, to give the customer for your current the fullest benefit of the present low prices for all interior wiring supplies in order that more and more lamps may be installed and the profits obtained in a legitimate and permanent form.

There are a number of additional matters which might be touched upon in considering this side of our subject, such as the effect of the competition of coal oil, gas and Welsbach burners; the recent governmental regulations and certain desirable extensions of the same, and so on. Not the least important of these, in view of the certain benefits to be derived, is the building up of this association into a strong and compact organization, able on the one hand to protect the industry in which its members are engaged from the attacks of conflicting interests or of ignorant and harmful legislation, and on the other hand by a frank interchange of experience and opinion to assist in hastening the day when progress and profit shall be the happy watchword in all cases describing the conditions of central-station operation.

It was intended, had space permitted, to discuss the subject of this paper from the other standpoint which has been mentioned—that of engineering and operation.

THE RELAY AND ITS RELATION TO THE TELEGRAPHIC CIRCUIT.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, NIAGARA FALLS, JUNE 16, 1897, BY THOMAS D. LOCKWOOD.

(Continued from page 8.)

An account of the Sturgeon electromagnet appears to have almost immediately set our own Professor Henry to experimentation; and within the year he had made certain radical improvements in the electromagnet, bringing it practically to the pitch of efficiency at which it now stands; although the why and wherefore did not, until within the last 20 years, find expression.

I scarcely think I can do better for you than to use the actual words of Henry himself. He says:

"The next improvement was made by myself. After reading an account of the galvanometer of Schweigger, the idea occurred to me that a much nearer approximation to the requirements of the theory of Ampere could be attained by insulating the conducting wire itself, instead of the rod to be magnetized; and by covering the whole surface of the iron with a series of coils in close contact. This was effected by insulating a long wire with silk thread, and winding this round the rod of iron in close coils from one end to the other. The same principle was extended by employing a still longer insulated wire, and by winding several strata of this over the first, care being taken to insure the insulation between each stratum by a covering of silk ribbon. By this arrangement the rod was surrounded by a compound helix formed of a long wire of many coils, instead of a single helix of a few coils. In the arrangement of Arago and Sturgeon, the several turns of wire were not precisely at right angles to the axis of the rod, as they should be, to produce the effect required by the theory, but slightly oblique; and, therefore, each tended to develop a separate magnetism not coincident with the axis of the bar. But in winding the wire over itself, the obliquity of the several turns compensated each other, and the resultant action was at right angles to the bar.

The arrangement then introduced by myself was superior, first in the greater multiplicity of turns of wire, and second in the better application of these turns to the development of magnetism. The power of the instrument with the same amount of galvanic force was by this arrangement several times increased.

The maximum effect, however, with this arrangement, and a single battery was not yet obtained. After a certain length of wire had been coiled upon the iron, the power diminished with a further increase of the number of turns. This was due to the increased resistance which the longer wire offered to the conduction of electricity. Two methods of improvement, therefore, suggested themselves. The first consisted, not in increasing the length of the coil, but in using a number of separate coils on the same piece of iron. By this arrangement the resistance to the conduction of the electricity was diminished, and a greater quantity made to circulate around the iron from the same battery. The second method of producing a similar result consisted in increasing the number of elements of the battery; or, in other words, the projectile force of the electricity which enabled it to pass through an increased number of turns of wire, and thus, by increasing the length of the wire, to develop the maximum power of the iron.

To test these principles, an experimental magnet was constructed. * * * From a series of experiments with this and other magnets, it was proved that, in order to produce the greatest amount of magnetism from a battery of a single cup, a number of helices is required, but when a compound battery is used, then one long wire must be employed, making many turns around the iron; the length of wire, and consequently the number of turns, being commensurate with the projectile power of the battery."

We may thus see that Henry's work in increasing the power of the electromagnet consisted, first, in insulating the wire instead of the core; second, in winding many layers; third, in showing that in a given circuit, with given battery or current, we may increase the attractive power of the magnet by adding turns to the winding, up to a certain point; fourth, in proving that, after reaching such certain point, the addition of more turns weakens the current by increasing the resistance of the circuit, more than it increases the magnetization of the core, by carrying the current so weakened round it, and, finally, in demonstrating that, when such point is reached, the increase in attractive power may be continued by connecting up two or more equal portions of the long, fine wire winding in parallel, instead of one after the other.

This summary of Henry's work shows that we have not advanced from the point to which he brought us, to any material extent.

Let us now see what we can do in the way of applying these principles to main telegraph lines, relays and local circuits.

The use of the relay and local circuit came straight from Morse, and is the subject of his second patent. Although subsequently on some telegraph lines it became possible to employ and get fair results from what we know as "main line sounders," or "registers," we are all well aware that the use of the relay, local circuit and sounder is wonderfully convenient on a long line; and it is as well recognized to-day as it was 30 years ago, that to work with locals and sounders is, generally speaking, by far to be preferred.

As the length of a circuit is increased, the strength of the current is correspondingly enfeebled; it is evident, therefore, that there is a limit beyond which, even if a large battery be used, signals will be too weak to act satisfactorily upon the receiving apparatus.

But the diminution of force due to resistance is as nothing compared with that arising from those defects of insulation which it is practically impossible to remedy, especially during wet or foggy weather. It is thus quite necessary, in working such circuits, to provide a receiving instrument capable of responding to a feebler current than that required for the sounder, which shall be able to close the local circuit of the sounder. This is the duty of the relay.

But while the mode of operation mentioned above is, as I have stated, to be preferred, let us not be satisfied without asking ourselves why?

Why should we not, and why do we not, place our sounder in the main line and work it, and save the relay and local battery? If this question were propounded to a score of operators, and intelligent operators, we may easily imagine a diversity of replies. One will say, "Because it won't work;" another, "Too low resistance;" another, "Wound with too coarse wire," etc.; but every one will agree with the unreasoning reason of No. 1—"It won't work." However, let us propound the question the other end to, and see whether we get more satisfactory replies. Why do we prefer to place a relay in the main line and employ it to control the sounder circuit? Again, we hear different supposed reasons: A says, "Because that is the right way to do it;" B says, "Because the relay has high resistance;" C reports, "Because the relay is wound with fine wire;" yet again we shall agree with A, when he says that "is the right way to do it;" and there is. I am sure, not one of us who, if he had two instruments at his disposal, a 150-ohm relay and a six-ohm sounder, would not think he was doing better to connect the relay in the main line and reserve the sounder for his local circuit.

The real truth is that we place the relay in the main circuit, not because it has higher resistance, and not because it is wound with fine wire, but simply because the current on the line at its best is but weak, and because it is, therefore, needful to carry that weak current round the iron core a very great many times, in order that we may get the requisite magnetizing force. But to do this we must have a large number of separate convolutions; and we can not have these without a very considerable length of magnet wire; moreover, to get a sufficiently large number of turns round the core, close enough to it to be of any use, we are compelled to use fine wire, so that, having a wire which is both small and long, we necessarily have a winding of relatively high resistance; or, as we say, we have a high-resistance relay.

We have now reached a point where we see that the essential thing is to carry our magnetizing current round the core many times. In other words, we want "ampere turns."

It is hardly necessary for me to recall to you that the ampere is the unit of current strength, and represents the current which we should get in a circuit having a total resistance of one ohm, with an electro-motive force of one volt, or in a circuit having a resistance of 100 ohms, with an electromotive force, say, a battery of 100 volts. We may get an idea of an ampere by considering that a 16-candle-power Edison lamp carries a current of about half an ampere, and that an arc lamp works with a current of from 8 to 12 amperes.

Now, we can not have, and do not need, any such current strength as that of an ampere on our telegraph lines. It would, for many reasons, be highly undesirable, and the current of a simplex telegraph line ranges from a minimum of about 20 to a maximum of 40 milliamperes. The electrical engineers of telegraph companies prefer to start out with about 40, being pretty sure that insulation will depreciate, and more relays will be added, without corresponding increase of battery, and that the current throughout the line will gradually creep down. So it comes about that, in all probability, the average current strength of telegraph lines is nearer 30 milliamperes than 40. Let me say here that the term milliampere simply means a thousandth of an ampere, so that a current strength of 30 milliamperes is $\frac{30}{1000}$, or about $\frac{1}{33}$, of an ampere.

Experimental research has deduced the general law that the magnetic force developed in a soft iron bar is proportional to the product of the strength of the current and the number of the turns surrounding the iron core; and this, in the profession, is termed "ampere turns."

Here, then, let me repeat that what we need in a relay to bring out its best attractive power is "ampere turns;" enough to bring out the necessary magnetic strength, but not

enough to add dead resistance without adding to the power of the magnet. If we can do this without using fine wire, so much the better; but we can not. If we can do this without involving high resistance—nay, without any resistance—so much the better; but we can not. And it is by reason of the circumstance that fine wire and high resistance are inseparable and inherent accompaniments of the ampere turns of relays, that the practice has grown up of specifying relays by their resistance; although such practice is inexact.

Pope, in his last revision, says:

"As the electrical resistance of a wire is directly as its length, and inversely as its sectional area or the square of its diameter, it will be obvious that the number of turns in the coil of any electro-magnet must have a direct and invariable relation to its resistance, and hence the resistance of a coil may be taken as a measure of the number of turns of wire it contains. This is convenient in practice, inasmuch as the resistance is easily determined by proper apparatus, while it is not so easy to find the number of turns in a coil after it has been wound. It is for this reason, and not because the resistance itself has anything to do with the matter, that it has become customary among telegraphists to classify electro-magnets by reference to their measured resistances."

Looking, therefore, to the production of magnetizing power alone, we can not avoid the inference that to get the best work out of our relays we must wind them up to a good many turns of fine wire, and that within certain limits we shall therefore find an advantage in high-resistance relays These "certain limits," of which I speak, are apparently reached in telegraph relays when the thickness of the winding, from the core to the outside layer, amounts to about one-half an inch; it is better to keep well within that limit, with a core three-eighths of an inch thick, and we may conveniently have a spool not much more than one and one-eighth inch to one and one-quarter inches in diameter. Wire wound on the spool of a telegraph relay a greater distance from the core than one-half of an inch, may be considered as adding resistance alone, without doing any good; and the rule for electro-magnets, generally, may be stated by saying: The best depth of coil for a given number of turns is that which approximately equals the diameter of the core.

(To be continued.)

Northwestern Electrical Association.

The meeting of the Northwestern Electrical Association, which is being held this week at La Crosse, Wis., will bring together a large number of the bright and energetic electrical men of the hustling West and Northwest. A special train will carry the Chicago delegates to La Crosse. The programme of the meeting is a good one, and the convention promises to be a success in every particular.

Bonds to take up $40,000 of sinking funds of the Erie Telephone and Telegraph Company's collateral trust five per cent gold debenture bonds were purchased by the Old Colony Trust Company, of Boston, as trustee, on July 15, under the call for offers of the same. The price paid was 100 flat.

Mr. John McGhie, of New York, advertising manager for the General Electric Company, sailed for London last week.

GENERAL NOTES.

The New York & Pennsylvania Telephone Company has declared its usual quarterly dividend of one and one-half per cent.

The earnings for June of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1897.	1896.	Increase.
Gross.....	$172,860 72	$159,068 02	$13,792 70
Net.....	63,205 26	57,412 39	5,792 87
Gross, six months..	1,238,766 31	1,105,904 64	132,861 67
Net, six months..	571,714 52	484,532 99	87,181 53

The officers of the Brooklyn, N. Y., surface railways have approved the proposition to erect elevators at the New York terminal of the Brooklyn Bridge for the accommodation of passengers on the surface cars. President Rossiter of the Brooklyn Heights Railroad Company says the work will probably be started by August 1. It is proposed to erect four elevators, each capable of carrying 100 persons, directly over the Park row entrance.

A freight wreck near Elmwood, Ct., on July 15 short-circuited the third-rail electric system and completely blocked the New England road for nearly three hours. A washout near Elmwood, due to the storm, made the west-bound track unsafe, and two cross over switches were put in, temporarily connecting with the third-rail track. As a freight train was taking the cross-over two cars were derailed by the frog and they dropped down on the third rail, making a short circuit and cutting off the power from the motor cars.

The Power Plant of the Pioneer Electric Power Company of Ogden, Utah.

(Concluded from Page 21.)

Of the nine bridges, the longest is that over the Ogden River. This is a riveted bow-string girder 75 feet long. The other bridges carry the pipe line over lateral ravines or were built in place of masonry-retaining walls, where a steel structure was cheaper.

The power-house is built of pressed brick, with concrete and rubble footings and cut-stone trimmings. Its outside dimensions are 135 feet in length by 50 feet in width. The roof trusses are of steel, and are supported on steel posts imbedded in the brick walls. A traveling crane of 15 tons capacity, operated by hand power, traverses the building, the track girders being carried by the steel posts. This building contains all the hydraulic and electric machinery used. A smaller, separate building serves as a machine and blacksmith shop.

FIG. 4.—PIONEER ELECTRIC POWER COMPANY—EXTERIOR OF POWER-HOUSE SHOWING ONE VENTURI METER AND RECEIVER.

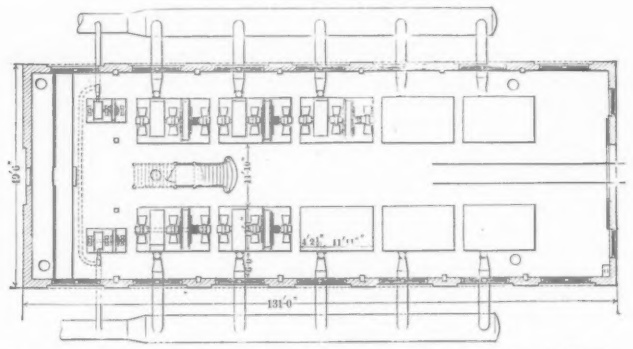


FIG. 5.—PIONEER ELECTRIC POWER COMPANY—PLAN OF POWER-HOUSE.

The water is delivered from the pipe conduit into two receivers buried in the ground, one at either side of the power-house. They are six feet in diameter, and, in their general appearance and the material used, closely resemble the regular steel pipe conduit, the thickness of the metal, however, being increased to seven-eighths of an inch, in order to allow for the water-hammer.

The receivers are provided with five safety valves each, which discharge when the pressure exceeds 200 pounds per square inch, and an outlet gate at the bottom. From each of these receivers five 30-inch and one 10-inch intake pipes extend to the walls of the power-house, to connect with the water-wheel nozzle pipes. Between these intakes and the nozzle pipes are placed the following valves in the order named: One 18-inch geared gate valve, one 18-inch hydraulic gate valve, and one 18-inch butterfly valve.

The 18-inch geared gate valve is only to be used in case of repairs to the particular machines that govern it. The 18-inch hydraulic gate valve is piped up to a small D valve, which is placed back of the switchboard and under the floor. By means of a lever on the switchboard, connected to this D valve, the gate can be opened or closed, at the operator's will. This valve is the one which is to be used for starting or stopping a wheel. The 18-inch butterfly valve is operated by means of a worm gear from the governor, and is used in checking the speed of the wheel by reducing the head or pressure near the nozzle, and thus avoiding a sudden fall of head in the main pipe line, which would be detrimental to the proper working of the plant.

The nozzle for the water-wheels has six rectangular openings or ports, one and eleven-sixteenths by three and one-half inches in area, of which the operator is able to close one or more, as he may desire. The levers that operate the hydraulic gate and nozzle are placed near the top of the switchboard. The set of levers for each water-wheel is placed in the panel governing the generator, which is driven by the wheel in question, so that the operations required in starting or stopping these machines are reduced to a minimum. The wheels are of the impulse type, directly connected to the generators. The complete plant will consist of ten units, five being already installed. The power-house and receivers being built for the ten, the balance can be readily installed at any time.

The Knight water-wheels are 59 inches in diameter and have 45 bronze buckets cast in one solid piece; 14 of these will, when the nozzle ports are all open, receive the water at the same instant. The centers of the wheels are made of cast-steel, the buckets being pressed on these steel centers and secured with bolts. These wheels are keyed to the generator shaft. Each wheel has a capacity of 1,200 horse-power, at 300 revolutions per minute, and each is provided with two flywheels, about 70 inches in diameter, each weighing about two tons.

The armature, armature shaft, two flywheels and one water-wheel, which comprise the moving parts, weigh 15 tons. This allows a uniform speed to be maintained, notwithstanding changes of head in the main pipe, or changes in the generator load. The water-wheel, flywheels, nozzle, and the two hydraulic cylinders controlling the nozzle ports are incased in a steel

housing, bolted to the machine bed-frame.

Between the two lines of machines, and down through the center of the building, underneath the concrete floor, is the spillway, into which the wheels discharge the water, and through which the water is carried back to the river from which it is taken.

The generators used in this plant are of the General Electric Company three-phase type, with 24 poles, and, at 300 revolutions per minute, have an output of 750 kilowatts at 2,300 volts, and a frequency of 60 cycles per second. The factory tests show that the variation in volts will be less than five per cent with a constant speed, should the full non-inductive load be thrown off or on.

Between the machine foundations and the building foundation wall, on each side of the building, is a subway which runs the entire length of the building and across the rear, and in this subway are carried all the necessary piping for water-wheel controllers and all the wires between the generators and the switchboards. The cable connecting each generator to its respective panel on the generator switchboard is a three-wire concentric 250,000-centimeter lead-covered cable, and the exciting wires are a two-wire concentric No. 4 Brown & Sharpe lead-covered cable.

The exciters used on this plant are General Electric six-pole 500-volt machines, and will give 100 kilowatts at 550 revolutions per minute. Each of these machines is ample for the entire exciting current that will be needed for the 10 750-kilowatt alternators, and they are each direct-connected to a 135-horse-power Knight water-wheel similar to the 1,200-horse-power water-wheels previously described. These exciter water-wheels are cross connected to each receiver, so that either exciter can be operated from either receiver.

The generator switchboard consists of seven marble panels—five for the alternators, one for the exciter and one for the instrument panel.

These panels are 26 by 90 inches each. They are built up of blue Vermont marble, with nickel fittings. There are two sets of three-phase bus-bars on the back, extending the entire length of the seven panels, as well as two bus-bars, also running their entire length, from which the exciting current is taken.

From the generator switchboard the current is carried to the distributing board over copper bars, of which there are two sets of three, connecting the two sets of bus-bars on the generator board with the two sets of bus-bars on the primary panels of the distributing boards.

The distributing board is in a gallery in the rear of the building and over the generator switchboard. Back of this distributing switchboard are nine 250-kilowatt air-blast, step-up transformers, the lightning arresters and the two blowers for cooling the transformers. The distributing board is divided into two sections—the primary section and the secondary section; each section has six panels. In the primary section, four of the panels are for the low-tension side of the step-up transformers, the remaining two being for the local distributing lines in the vicinity of the power-plant. In the secondary section, four of the panels are for the high-pressure side of the step-up transformers, and two for the long-distance transmission lines.

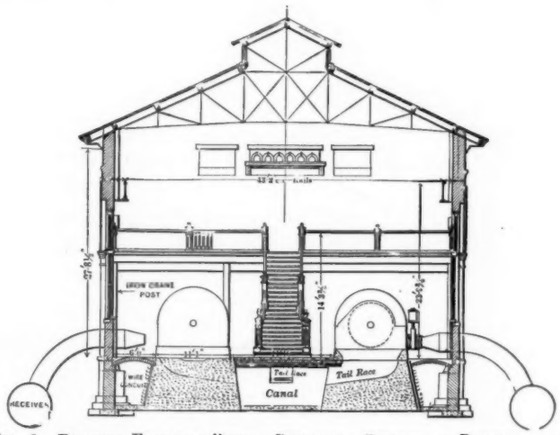


FIG. 6.—PIONEER ELECTRIC POWER COMPANY.—SECTION OF POWER-HOUSE.

Back of the distributing switchboard, and on a raised platform, are placed the step-up transformers. These transformers raise the potential of the current from 2,300 to 16,100 volts, at which pressure it goes on to the long-distance transmission lines. The transformers are connected up in sets of three, the delta connection being used on both sides. At each end of the building in the gallery are placed the two blowers, direct connected to a two and one-half horse-power, 500-volt, direct-current motor. These blowers are used in cooling the step-up transformers, and force the air up through the bottom of the transformers, around the coils and out at the top.

The transmission line is calculated to deliver about 3,000 horse-power at the sub-station in Salt Lake City, distant about 38 miles, and consists of two circuits, making six wires of No. 1 Brown & Sharpe gauge.

The poles used on this line are of Oregon cedar, and are good, clear, straight poles, 30, 40, 50 and 70 feet long, with 9-inch and 10-inch tops. There are two cross-arms on each pole for the wire; two wires are on the top arm, four feet apart, and four wires on the bottom arm, each two feet apart, a circuit being on each side of the pole. These wires are so arranged that, should a plane be placed perpendicular across the circuit, it would show an equilateral triangle, with a wire at each angle, the length of the sides being two feet. These wires are transposed about every half mile. By this arrangement of the pole-line wire the inductive effect is reduced to a minimum.

About six feet below the second cross-arm on the pole is a two-pin cross-arm, on which the telephone wires are strung, being transposed about every four poles, there being an average of about 50 poles per mile.

The current is fed into the transmission line at the power-plant at 16,100 volts, and delivered to the step-down transformers at 13,800 volts. This will give an energy loss of about 10 per cent in the line, and a potential loss of about 14 per cent. The sub-station step-down transformers deliver this current to the local distributing lines again at 2,300 volts. There are at present nine 250-kilowatt step-down transformers at the sub-station connected by the step-up transformers, and the switchboard in the sub station is similar in every respect to the distributing board in the power-plant gallery. The cooling apparatus here is also identical with that used in the power-plant, except that the motors used are 60-cycle induction motors.

FIG. 7.—PIONEER ELECTRIC POWER COMPANY.—INTERIOR OF POWER-HOUSE.

While the transmission lines are at present capable of delivering 3,000 horse-power at the sub-station, with a 10 per cent energy loss, if it should become necessary, the step-up transformers can deliver more than this by changing three wires on their high-pressure side, and delivering the current into the transmission lines at 27,000 volts. Thus the line capacity would be more than doubled.

The present installation of the power-plant is capable of delivering 3,750 kilowatts to its lines, but ample provision has been made to increase this amount to 7,500 kilowatts by installing five more 750-kilowatt machines as new industries or manufactories spring up as the result of the advantages offered to them in Ogden and Salt Lake City.

There is one important feature in the arrangement of the machinery which should be noticed; viz., the complete duplication of all parts. All portions of the plant below the breeches-pipe casting at the lower end of the six-foot conduit are absolutely symmetrical about the center line of the power-house, each side being entirely independent of the other. This applies not only to the pipe and the receivers, but to all the parts of the switchboards, etc., as well as to the generators and water-wheels. Either one of the exciters, also, is capable of providing sufficient current for all the large generators, and can be run with water from either receiver. The advantage of this arrangement is that an accident to either receiver or to one or more wheels or generators would not result in the shutting down of the entire plant, but, at the worst, of only one side. For a short period all the required power could probably be supplied from one side of the power-house.

The current will be used to drive factories, running electric railways from Ogden to Salt Lake City, to the lake, to Hot Springs, and to light the towns and cities in the north of the State. The surplus water in the storage reservoir will be utilized to irrigate large tracts of land in the vicinity.

The Pioneer Electric Company was organized November 27, 1893. The president and treasurer of the company is the Hon. Geo. Q. Cannon, the intellectual and diplomatic head of the Mormon Church. The general manager is Frank J. Cannon, son of the president and United States Senator from the State of Utah. The directorate consists of Wilford Woodruff, president of the Mormon Church; Joseph F. Smith, one of his counselors; F. D. Richards, one of the apostles; Asahel Woodruff and A. B. Patton, president of the Ogden Chamber of Commerce. Mr. Patton and the chief engineer and secretary, Mr. C. K. Bannister, are the only men among the directorate not members of the Mormon Church.

The conception and successful completion of the works belonging to the Pioneer Electric Power Company are largely due to the efforts of C. K. Bannister, Member American Society of Civil Engineers, who, as chief engineer and secretary of the company, has devoted several years to the careful study of the engineering and financial problems involved. Preliminary surveys were made in 1894 and 1895, but it was not until the beginning of 1896 that the location of the plant was definitely settled and actual construction begun.

ADVANCE INFORMATION

Electric Light and Power.

ST. JOSEPH, MO.—The Light and Fuel Company's plant has been sold to C. H. Randle, of Chicago.

MADISON, WIS.—The State Board of Control has awarded the contract for the putting in of an electric lighting plant at the Northern Hospital at Oshkosh, to the Western Electric Company, of Chicago.

VICTORIA, TEX. — The electric light plant has been sold to H. H. Rathbone and L. L. Stephenson, of this city. A new corporation was formed, composed of H. H. Rathbone, L. L. Stephenson, F. C. Sibley, F. C. Proctor and N. Whips.

SANBORN, IOWA—An electric light plant is to be established here.

OAK HARBOR, OHIO—An electric light plant is to be established here.

BROOKFIELD, MO. — The Brookfield Electric Light Company has been incorporated, with a capital stock of $30,000.

COLUMBUS, GA. — The Columbus Power Company applied for charter, with John Hill, G. Gunby Jordan and John F. Hanson as incorporators, to develop water power by electric current, etc. Capital stock, $100,000.

NEOSHO, MO.—The Neosho Electric Light Company has been incorporated by T. P. Radcliff and others, with a capital stock of $6,000.

LAFAYETTE, LA.—The Mayor may be addressed concerning $38,000 worth of bonds to be issued for the erection of electric light plant and the construction of waterworks.

NEWTON, N. C.—The Mayor may be addressed concerning erection of electric light plant.

ST. PETERSBURG, FLA.—An electric light plant is to be established here.

GUNNISON, COLO.—The Greeley Power and Light Company is gradually extending its system into the residence portion of the city.

ATTALLA, ALA. — The Attalla Foundry and Machine Company has leased the waterworks and electric light plant from the city of Attalla for a term of five years. The lessees will furnish the city with water and lights at $50 per month, and repair the works, etc.

CANON CITY, COLO.—A new electric light plant, to cost $200,000, will be completed and in operation by the end of the year.

KANSAS CITY, MO.—The South Side Electric Light and Power Company has been incorporated by Henry Pfeiffer, L. A. Schaeffer and George C. Hale. Capital stock, $30,000.

PORT HURON, MICH.—Port Huron Light and Heating Company has been incorporated, with a capital stock of $40,000.

BRIDGEPORT, CT. — The Liquor Dealers' Association will consider the establishment of a co-operative electric lighting plant.

CHESTER, PA. — J. L. Glenn, chairman Board of Public Works Commissioners; concerning construction of an electric light plant.

ROCHESTER, MINN.—T. H. Titus, secretary Board of Trustees, Rochester State Hospital for the Insane, may be addressed concerning electric light plant.

LANSDALE, PA.—The citizens of this place will vote on the proposition to borrow about $25,000 with which to erect an electric plant or purchase the plant now in operation there. The company offers to sell its franchise for cost, less than $5,000.

MARQUETTE, MICH.—The electric lighting system of the Pennsula Electric Light and Power Company is now in operation at South Lake Linden.

ALBANY, N. Y. — The Central Union Gas Company, of New York, has been incorporated, to supply gas and electricity in New York, Westchester, Kings, Queens and Richmond counties. Capital, $3,500,000. Directors, Richard N. Young, Jas. E. Tolfree, Chas. L. Horton, Edward Canfield, of New York; Thos. S. Smith, of Brooklyn.

New Electric Railways.

TOLEDO, OHIO—The right of way has all been secured for an electric railway line between this city and Genoa, and some eastern capitalists have interested themselves in the project.

WARREN, OHIO—Cleveland men are again investigating the project to build an electric railway from Chagrin Falls to Burton, Orwell and Andover.

PITTSBURGH, PA. — The Second Avenue, Pleasant Valley and Manchester roads will be succeeded by the United Traction Company.

YOAKUM, TEX.—A company will probably be formed to build a street railway line in Yoakum.

CHARLESTON, S. C.—The Charleston City Railroad Company has completed its electric line and cars are now in operation.

WEBSTER, MASS.—Edgar S. Hill and Oscar Shumway are interested in the construction of an electric road from Webster to the resorts on the big lake. It is supposed by the promoters that a franchise can be secured.

NEWBURGH, N. Y.—The Newburgh Electric Railway Company has been incorporated as the result of the consolidation of the Waldon & Orange Lake and the Newburgh & Orange Lake Railroad companies with the present Newburgh Electric Railway Company. The capital is $150,000, and the directors are Benjamin Norton, of New York city; Silas B. Dutcher, William H. Pouch, Alfred J. Pouch, Frederick J. Pouch, Alden S. Swan, William M. Tobias and S. S. Whitehouse, of Brooklyn, and Charles N. Finch, of Summit, N. J.

ROME, N. Y.—It is reported that an effort is being made to have an electric road built from this place easterly, connecting with the suburban line at Oriskany and the Belt Line at Whitesboro, making a continuous journey by electric road between Oneida County's two cities.

BALTIMORE, MD.—The Baltimore Consolidated Railway Company has let contracts for the extension of its line on Paca street, also for overhead electric work, and will increase the capacity of the power-house on Pratt street, which will be used to supply current for the lines.

HARRISBURG, PA. — The Beaver and Vanport Electric Railway Company has been incorporated by J. M. Buchanan, W. A. McConnell, J. H. Wilson, A. T. Anderson and J. T. Taylor, to construct and operate an electrical road two miles long, from Beaver to Vanport. Capital stock, $12,000.

JACKSON, MICH.—An electric railway is proposed, to extend from this place to Howell via Dansville.

New Telegraph and Telephone Companies.

HUNTINGBURG, IND.—A telephone line from this place to English is to be built at once.

DEL NORTE, COLO.—A telephone line is being built from this place to Summitville.

BOULDER, COLO.—Mr. J. B. Connors will take charge of the uptown office of the Western Union Telegraph Company, which will be opened here within a week.

PORTSMOUTH, VA.—The Southern States Telephone Company will have their line in operation between this place and Suffolk in a few days.

WEST TOPSHAM, VT.—A telephone line is soon to be run from this place to Waits River and East Orange. The poles have already been set.

New Incorporations.

PHILADELPHIA, PA.—The Reed-Morrill Electric Company has been incorporated by Charles J. Reed, Marcellus T. Morrill, James W. Laws, Harry C. Harmon and Hollie A. Harmon. Capital stock, $10,000.

NORTH COLLINS, N. Y. — The North Collins Improvement Company has been incorporated by Henry C. Springer, Joseph Thiel, Herbert T. Auerbach, Frank F. Gaylord and Annie E. Auerbach, to manufacture gas for lighting and heating purposes. Capital stock, $5,000.

SILVER CITY, N. M.—The Silver City Electric Company has been incorporated. Incorporators, M. W. and James B. Neff and W. A. Hawkins. Capital stock, $19,000.

NEW YORK, N. Y.—The Ion Manufacturing Company has been incorporated to manufacture vehicles, boats, elevators, motors and electrical gas and pneumatic machines. Capital, $250,000. Directors: Thomas W. Horn, of Toronto; Owen T. Bugg and Walter R. Clayton, of New York city, and others.

Increase of Capital.

TAYLORVILLE, ILL.—The Taylorville Electric Company has increased its capital from $22,000 to $25,000.

WARRENSBURG, MO.—The Magnolia Light, Heat and Power Company has increased its capital stock from $20,000 to $30,000.

Electrically Welded Steel Barrels.

A London contemporary describes a method of making welded steel barrels, which is now carried on at Uxbridge, England, under the Barrbeat-Stange patents. The body of the barrel is rolled out of steel plate, and buckling is prevented by easing the rolls at the ends. The rolls then bear only on the center of the sheet passed through them, and thus extend the metal there and there only, the sheet remaining its original length at its two edges. Under these conditions it shapes itself naturally into the barrel form as the rolling proceeds, and when removed only requires its ends sheared straight in a special machine, and to have its longitudinal seam welded. This latter operation is effected electrically by the Bernados process, with which no skilled labor is required. The bent sheet is clamped with its two opposing edges some one-fourth inch or three-eighths inch apart; a small fragment of steel is placed over the opening and melted by means of the electric arc by one man, while another stands by to hammer it as soon as ready. By welding on successive fragments in the manner named, the whole joint is finally completed, and the cask is finished by adding its heads and its bung bosses. The heads are first cut in a circular shearing machine, and then corrugated and dished in a 400-ton hydraulic press. The dished edge fits inside the barrel head, and a ring of sheet metal three-fourths inch to one inch wide is also placed round the head of the barrel outside. The three edges of this ring, of the barrel itself, and of the head, are then melted together by the electric arc. The bung bosses are also welded on. These are steel stampings, and being much thicker than the sheet forming the barrel body, it is the practice after the weld is finished to place a heavy mass of hot iron on top of the work until the whole is cooled down. A certain annealing effect is thus secured by which possible contraction strains at the joint are avoided. The Uxbridge works of the company have a present capacity of about 240 barrels per week.

KIND WORDS.

THE REVIEW ALWAYS SUFFICIENT.

TO THE EDITOR OF ELECTRICAL REVIEW:

I am receiving and carefully reading the ELECTRICAL REVIEW regularly and have been a close student of electricity for over 15 years. I have found the REVIEW complete and sufficient, and recommend it to all within my influence. With best wishes, Very sincerely yours,

July 8. J. M. ORAM.

INTERESTING EVERY WEEK.

TO THE EDITOR OF ELECTRICAL REVIEW:

The ELECTRICAL REVIEW is unquestionably a wide-awake, go-ahead paper, and fully up to the requirements of those interested in electrical matters generally. I find a lot of interesting matter in each number.

L. G. M.

Hamilton, Bermuda, July 7.

Kindred.... ...Interests

"**Self Help**" is the title of an interesting publication issued by the International Correspondence Schools, Scranton, Pa.

The Bibber-White Company, 49 Federal street, Boston, are sending to their friends and customers a neat penholder accompanied by a card which says: "We send you this pen to write your orders with. Please use it often."

Messrs. Sheehan & Hewitt, electrical engineers and contractors, 14 South Water street, Newburg, N. Y., will hereafter act as selling agents for the C & C Electric Company through the central, northern and western counties of New York State.

The severe competition in the manufacture of electric bells has resulted in lowering the grade as well as the price of the regular electric house bell. Realizing the fact that the trade demanded a better article in the line of an iron-box bell the Electric Appliance Company, of Chicago, are placing on the market their Reliance iron-box bell, which they claim is considerably better than anything in this line that has been placed on the market for some time. These bells cost more money to make, but are put on the market at an honest price, and to meet the demand of customers who are willing to pay a fair price for a good article.

The American Electric Heating Corporation, of Boston, reports a lively business in laundry irons, stoves and similar heating goods since the summer season opened. It is only appreciated by actual experience how little heat is wasted in heating the room when using domestic, electrically heated utensils. In several laundries, by actual test, a difference of less than two degrees in temperature over the ironing tables was the result of using electric irons; while the same room, when using gas heaters, was from 10 to 12 degrees hotter. For summer business the central-station manager will find electrically heated smoothing irons and domestic utensils worthy of much consideration.

The American Electrical and Maintenance Company—A. K. Warren & Company, of New York City, have issued the following circular: We beg to inform you that on July 1 our business and that of the Electrical Maintenance Company, of New York, were consolidated, and that, having incorporated under the laws of the State of New York, we shall continue business under the name of the American Electrical and Maintenance Company. The firm of A. K. Warren & Company has been dissolved by mutual consent of the two partners, A. K. Warren and J. R. Steers, who have been elected, respectively, president and treasurer of the new company. George Stanmore, general manager of A. K. Warren & Company, has been appointed trustee for the purpose of winding up the affairs of the late partnership.

"**A Summer Note-Book**" is the title of a very attractively gotten up pamphlet, issued by the Michigan Central Railroad, and which, through the courtesy of Mr. W. H. Underwood, Buffalo, N. Y., general eastern passenger agent, finds its way to the editorial desk. The illustrations and text unite in making all who read long for a visit at some one of the numerous cool Summer places reached over this fine line. "The Niagara Falls Route," as this road is very properly called, with its valuable connection with the New York Central, constitutes one of the greatest and most convenient of our trunk lines between the East and West, and its popularity under its progressive management constantly increases. The "Note-Book" does not fail to do justice to the subject, and it is pleasant for the editor in the hot city to read about these lovely, cool places, if he never sees them.

POLES. 4,000 30-feet sound cedar 7-inch tops.
Can be shipped immediately.
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The Telephone Man's Text Book.
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"TELEPHONES, THEIR CONSTRUCTION AND FITTING,"
BY F. C. ALLSOP.
Description of Receivers, Transmitters, Switch Boards, Complete Instrument Switches and Switch Boards, Erecting Telephone Lines, Overhead Wires, Instruments, Connecting, Testing for and removing faults.
256 Pages. Illustrated. Price, $2.00.

"TELEPHONE LINES AND THEIR PROPERTIES,"
BY W. J. HOPKINS.
Contents: Design and Construction of City Lines.
Underground Work.
Long Distance Lines.
Wire, Insulators, Exchanges, Switch Boards.
The Propagation of Energy.
The Telephone Current.
Measurement.
Properties of City Lines, Cables, Etc.
Price, $1.50.

"MANUAL OF TELEPHONY,"
BY W. H. PREECE AND ARTHUR T. STUBBS.
Price, $5.50.

"ELECTRIC TELEPHONY,"
BY E. J. HOUSTON AND A. E. KENNELLY.
New. Price, $1.00.

"HOW TO MAKE AND USE THE TELEPHONE,"
BY GEO. H. CARY.
The purpose for which this book is written is to furnish information to those who may desire to construct or use telephones, telephonic apparatus or lines on a small scale.
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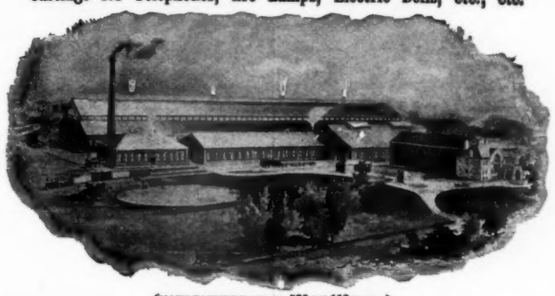

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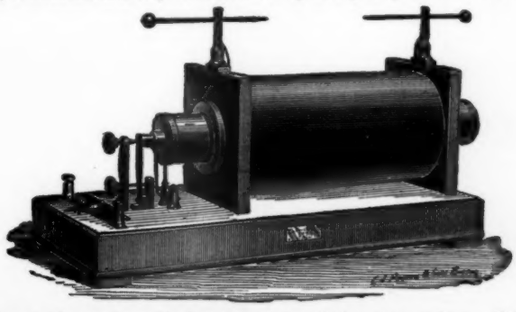

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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JUNE 29, 1897.

585,171 Burglar-alarm system; W. T. Arnold, Chicago, Ill.

585,229 Apparatus for applying heat to thermo-batteries; H. C. Reagan, Philadelphia, Pa.

585,249 Electric clock; R. Baumann, St. Louis, Mo.

585,250 Combined electric fan and electrolier; E. H. Bennett, Jr., Bayonne, N. J.—An electric fan, and a central support for said fan and its motor, an electrolier also sustained by said central support and comprising a plurality or series of electric lamps which are carried by a holder detachably connected with said central support, so that the lamps carried thereby may be removed from the fan, collectively, by detaching said holder.

585,255 Contact-box for electric railways; W. M. Brown, Johnstown, Pa.—A sealed vessel removably secured within said box, containing a switching mechanism consisting of a solid conductor floating or immersed in a liquid conductor.

585,257 Electric meter; F. P. Cox, Lynn, Mass.—A meter for registering at different rates at different times, consisting of a single motor mechanism and a single registering mechanism, and means for controlling the speed of the motor for a given load from a point distant from the meter.

585,258 Electric metering apparatus; F. P. Cox, Lynn, Mass.

585,267 Electric trolley device; A. J. Gairing, Johnstown, Pa,

585,287 Ground detector; E. W. Rice, Jr., Schenectady, N. Y.—A system of stationary inducting plates, some of which are connected to one side of the line and others to the other side, a second set of plates maintained at equal potential and insulated from the first, and an indicating device in inductive relation to the stationary plates.

585,293 Electric contact device; S. H. Stahl, Johnstown, Pa.—A contact-carrying frame composed of jointed links, the joints being located alternately on opposite sides of the vertical longitudinal center of the device.

585,301 Electric tower clock; T. H. Wurmb, St. Louis, Mo.

585,307 Electric dynamo or motor; C. E. Emery, Brooklyn, N. Y.

585,308 Electric broiler; G. B. Fraley, Denver, Colo.—Consists of supporting devices for the meats or other articles to be broiled, heating-blocks located on either side of said devices and independent therefrom, means for passing an electric current through said heating-blocks, and means for rotating the latter and said supporting devices in unison without interrupting the flow of electricity to said blocks.

585,309 Electric heater; G. B. Fraley, Denver, Colo.—A block having an upright U-shaped channel, a plurality of elements contained therein, means for causing said elements to automatically contact with each other, and means for indicating when said channel should be replenished.

585,310 Alternating-current electric heater; G. B. Fraley, Denver, Colo.

585,311 Electric heater; G. B. Fraley, Denver, Colo.—Consists of a slotted core, and a resistance coil wound around said core.

585,316, 585,317 Electric arc lamp; P. H. Klein, Jr., New York, N. Y.

585,318 Electric arc lamp; E. Lavens, Brooklyn, N. Y.—Consists of the lower-carbon holder which has a vertically bored out portion for reception of the carbon, the sliding pivoted cover for the lower end of said carbon-holder, and means for pressing said sliding cover against the bottom of the carbon-holder to secure an air-tight covering therefor.

585,319 Telautograph; L. O. McPherson, Highland Park, Ill.—Consists of a line wire, means for causing pulsations to traverse the same, and a governor operating to change the strength of current on line to compensate the effects of changes in frequency of the pulsations.

585,321 Insulating joint; L. F. Van de Wiele, Brooklyn, N. Y.

585,342 Electric train signal; M. W. Parrish, Detroit, Mich.—Comprises two circuits, a signal, a source of electric energy spool magnets, a pivoted muffling-armature, and a permanent magnet adapted to lock the muffling-armature when the signal-circuit is broken.

585,350 Bracket for incandescent lamps; H. Noreck, Charlottesville, Va

585,379 Dynamo-electric machine; G. E. Dorman, Chicago, Ill.

585,444 Rheostat and circuit controller; H. W. Leonard, East Orange, N. J.

585,472, 585,473 Secondary battery; G. E. Hatch, Quincy, Mass.

585,480 Electric time alarm; A. C. Roebuck, Chicago, Ill.—Comprises a graduated dial driven by clockwork and carrying adjustable arms adapted to be set to the time when the alarm is to be sounded, and a lever adapted to be actuated by the said alarm, to move a contact-point on the said lever in the path of the contact point on the minute hand of the clock, to close the circuit.

585,511, 585,512 Circuit controller for electric motors; H. H. Cutler, Chicago, Ill.—Consists of a circuit controlling arm or element, a retaining electro-magnet for locking the same in position, means for moving the same when released to alter the condition of the circuit, a releasing electro-magnet for de-energizing said retaining electro-magnet upon the flow of an abnormal current, and means for adjusting said releasing electro-magnet to cause the same to respond to a predetermined current strength.

585,527 Electric motor; C. Lindberg, Duluth, Minn.

585,560 Electric telephone; C. E. Dunderdale, Chicago, Ill.

585,603 Electric arc lamp; C. J. Toerring, Jr., Washington, Pa.—An arc-inclosing globe, a mounting for the same permitting lateral movement of the upper end of the globe, and a cover having a hole for the passage of the upper carbon.

585,620 Electric accumulator system; H. B Cox, Hartford, Ct.

ISSUED JULY 6, 1897.

585,647 Electro-pneumatic circuit closer; B C. Batcheller, Brooklyn, N. Y. A circuit closer, consisting in the combination with a pneumatic tube and carrier therein, of a circuit-closing device operated by the differential pressure incident to the passing of the carrier.

585,662 Switchboard for central telephone stations; C. E. Egan, Chicago, Ill.—Flexible arms having sockets mounted thereon, contact-points on each side thereof included in the circuit of the signaling apparatus.

585,699 Reversible primary battery; L. W. Pullen, Camden, N. J.—A reversible primary battery comprising a suitable cathode, a depolarizing mass in contact therewith, and consisting of a mixture of finely divided plumbago, concentrated sulphuric acid and a salt of manganese, and an anode arranged in a dilute electrolyte.

585,707 Joint or splice for electric wires or cables and method of making same; F. Schwedtman, St. Louis, Mo.—A joint or splice for wires or cables consisting of interlocking hooks on the ends of adjacent wires or cables and having metal cast thereabout, so as to incase the same.

585,726 Electric arc lamp; J. J. Walsh, Paris, Tex.

585,731 Telegraph switch; J. S. Allen, Halsey, Neb.

585,733 Railway signaling system; H. Bezer, New Rochelle, N. Y.

585,746 Brush-holder; H. Geisenhoner, Schenectady, N. Y.—A rotatable stud, one or more brush-holders adapted to be rotated on and adjustably held in fixed position on said stud, and means for adjustably clamping and holding in fixed position said stud.

585,760 Electric motor for elevators; J. D. Ihlder, Yonkers, N. Y.—In an electric motor in which the current through the armature is reversed, a series field in sections, one section of which is reversed with the reversing of the armature.

585,772 Electric controller; A. F. Macdonald, Schenectady, N. Y.—A single set of moving contacts, two sets of brushes mounted for dissimultaneous engagement therewith, the two sets of brushes establishing different circuit combinations of the dynamo-electric machines, and means for changing the relation between the contacts and sets of brushes.

585,853 Secondary battery; I. Samuels, New York, N. Y.

585,854 585,855 Galvanic battery; J. Sully, New York, N. Y.

585,863 585,864 Armored electrical conduit; E. T. Greenfield, Brooklyn, N. Y.—A conduit having an external metallic armor, an internal tube or lining of insulating material, and an interposed layer of fibrous material which is impervious to moisture.

585,872 Brush-holder for dynamo-electric machines; R. Lundell, Brooklyn, N. Y.

585,892 Electricity meter; A. W. Staveley, Leicester, England.

585,896 Telephone transmitter; E. C. Wilcox, Meriden, Ct.

585,904 Automatic cut-out; C. N. Black, New Haven, Ct.

585,915 Operator's switch for telephone exchanges, L Johnston, La Crosse, Wis.

585,937 Electro-magnetic and mechanical brake; John E. Parker, Bayonne, N. J.

586,029 Electric switch; Frank D Hall, Syracuse, N. Y.

586,044 Electric storage or secondary battery; Frank King, London, England.

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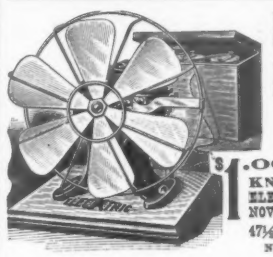
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